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Diagnostic Classifications for Bipedal Locomotion

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DIAGNOSTIC CLASSIFICATIONS FOR BIPEDAL LOCOMOTION

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ABSTRACT

Background: Analysis of and intervention for movement dysfunction, especially walking dysfunction, is the central expertise of physical therapists (PTs). PTs are called to establish a diagnosis prior to making patient management decisions yet no valid classification system for walking exists. Objectives: The purpose of this study was to determine if locomotor experts could arrive at consensus on the validity, mutual exclusivity and understandability of diagnostic classifications for bipedal locomotion. Methods: An electronic mail Delphi survey methodology was utilized. Experts were recruited purposefully through research and clinical leaders in the PT profession. Identified experts were then asked for their recommendations in the snowball phase of recruitment. In the first survey, the panelists were asked if any of the 15 original classifications should be added removed, reworded, or merged. In Rounds 2 and 3, following a summary of responses from the previous round, panelists were asked to rate the validity, mutual exclusiveness and understandability of each original and modified classification using a 4 point Likert Scale as well as to comment on them. Constant comparative analysis was used to analyze qualitative data and non-parametric statistics was used for ordinal data ($p < 0.05$). Consensus was defined as: 1) greater than 75% of

participants agree or strongly agree that a classification is valid, mutually exclusive and understandable, 2) no difference between Rounds 2 and 3 responses, 3) Kappa coefficients are $\geq$ .60 and 4) there is a reduction in the percentage of panelists who comment as well as a convergence of themes between Rounds 1 and 3. Results: A total of 287 participants were invited initially and 58 experts participated in all rounds. Full consensus was reached for 5 of the modified diagnostic classifications and partial consensus for 6. There were no significant differences between Rounds 2 and 3 ratings and there was a decrease in the percentage of panelists who made global comments between Rounds 1 and 3. Other measures of consensus did not reflect full consensus. Conclusions: This study provides initial validation for several bipedal locomotor classifications and provides a model for development of diagnostic classification systems for physical therapist practice.

Keywords: diagnostic classification, bipedal locomotion, diagnosis, Delphi, gait

DEDICATION

This dissertation is dedicated in loving memory of my parents, Norman and Caroline Deming, who instilled in me the value of education, a love of learning and provided me with a strong start to my education. They would be proud. I also dedicate this dissertation to my family; my husband, Glenn, and children, Dana and Ethan, for their unconditional love, support and understanding throughout this process.

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TABLE OF CONTENTS

LIST OF TABLES

Table *Page*

LIST OF FIGURES

Figure *Page*

INTRODUCTION

Analysis of and intervention for movement dysfunction is the central expertise of physical therapists (PTs). Walking dysfunction is arguably the most prevalent movement problem that PTs address. Over 20 years ago the American Physical Therapy Association (APTA) leadership stated that PTs should establish a diagnosis prior to making patient management decisions. “Diagnosis by PTs is defined as both the process and end result of evaluating examination data that the therapist organizes into defined clusters, syndromes or categories to help determine prognosis and intervention.”[1] Since then there have been numerous calls for PTs to develop and apply classification systems to guide and standardize physical therapist practice, improve communication amongst colleagues and categorize patients so that treatment effectiveness can be studied more effectively.[2-5] Despite this, there is no valid classification system for walking dysfunction that has gained widespread clinical acceptance.

General and diagnostic specific gait classification systems have been developed for both adults and children. Movement Systems Diagnoses (MSD) is a general body structure function (BSF) level clinical diagnostic classification based on observational gait analysis and BFS examination[6, 7] that are linked to various diagnostic classifications that are not gait specific. Winter[8] proposed a diagnostic gait classification based on observed gait kinematics, and measured temporal variables. Biomechanical and neurologic kinematic instrumented analysis was applied to understand the primary

underlying cause of the abnormal kinematics. A stroke-specific gait classification identified 3 types of impaired electromyographic (EMG) patterns[9] and 4 kinematic patterns[10] of gait deviations using instrumented data. Four types of abnormal kinematic motor dysfunction were identified by observational gait analysis (OGA) in persons post traumatic head injury.[11] This was followed by identification of ability to control muscles, muscle stiffness and contractures within the clinical patterns via instrumented analysis. None of these classification systems have been demonstrated to be valid and most require instrumentation not available clinically.

Gait classification systems for children with cerebral palsy have been developed from basic clinical kinematic observations in conjunction with data from kinetic, kinematic and EMG instrumention.[12-16] A review of gait classifications for children with cerebral palsy concluded that none of the existing classifications reliably or validly characterized the full range of gait deviations associated with cerebral palsy, nor did they represent clinically meaningful categories.[17] In addition, most of them require instrumentation. Since that review, a classification defined by clinical experience and statistical analysis of kinematic gait data was developed to categorize the gait of children with cerebral palsy into 13 different styles through OGA. Criterion validity[18] and inter and intra-rater reliability[19] of this tool has been demonstrated, its clinical meaningfulness has yet to be explored.[20] One OGA based assessment tool has been developed for children with Down Syndrome.[21]

Neurologists use OGA to diagnose gait abnormalities but there is no clear consensus of the optimal diagnostic classification.[22] Neuroanatomic classifications result in labels such as frontal or cerebellar gait.[23] Phenomenological or syndrome

classifications use constellations of kinematic descriptions leading to labels such as ataxic or spastic gait.[23] A hierarchical approach bases gait classifications on levels of the nervous system.[22] Lower level systems included dysfunctions associated with peripheral sensory and motor system impairment. Middle level systems included impaired execution of centrally selected postural and locomotor synergies. High-level gait characteristics were non-specific and more variable. Some classifications were combined in order to make diagnosing high-level locomotor disorders easier.[24, 25]

All of the these classifications are based on the construct of gait, defined as a manner of walking or moving on foot.[26] Patla[27] approached the walking problems of older adults uniquely by applying the construct of locomotion, defined as the movement of an organism from one place to another.[28] By considering locomotion instead of gait, Patla's approach takes several movement systems into account - neural, biomechanical, perceptual, and energetics. The framework also considers the environmental demands on locomotion. Patla described several locomotor control systems that act on and interact with the musculoskeletal system to influence the expression of skilled locomotor behavior. The control factors or requirements identified were: core locomotor pattern, active propulsion, weight support, dynamic equilibrium, steering and accommodation, maintaining structural integrity, minimization of energy expenditure and cognitive spatial mapping. Patla postulated that it would be more revealing to identify dysfunction associated with these control factors in older adults with mobility dysfunction than impairments in a standard neurologic examination because deficits in any one area may or may not have a direct relationship to mobility deficit.

Consensus about basic requirements of bipedal locomotion could provide a framework for classifying bipedal locomotor dysfunction that might meet the need expressed by Nutt et al. (2011)[29] for new classifications of gait and balance disorders based on function of the locomotor and balance circuits. These could form the framework underlying a diagnostic clinical gait assessment tool – a need identified by clinicians[30] and researchers who work with adult neurologic patients.[29] A feasible and systematic assessment tool would enable PTs to categorize locomotor problems so that hypotheses about underlying causes and decisions about further examination and treatment can be organized.

The purpose of this study was to arrive at a consensus about the fundamental requirements of bipedal locomotion. Primarily we wanted to determine if a group of locomotor experts could arrive at consensus on the validity, mutual exclusivity and understandability of diagnostic classifications for bipedal locomotion. Secondarily we wanted to answer the following questions:

1) Do locomotor experts who primarily conduct research and those who primarily practice clinically agree on the validity, mutual exclusivity and understandability of the diagnostic classifications for bipedal locomotion?
2) Do locomotor experts who primarily treat or study adults and those who primarily treat or study children agree on the validity, mutual exclusivity and understandability of diagnostic classifications for bipedal locomotion?

METHODS

Design Overview:

A 3-round electronic mail survey using the Delphi methodology was utilized to examine the face and content validity of the proposed locomotor classifications. The Delphi survey technique is well suited to test the study research questions because it is a group facilitation process that endeavors to reach consensus amongst a group of knowledgeable individuals through a series of structured surveys. The process transforms individual opinions into group consensus by feeding back the group results to all individuals in each subsequent survey. This allows participants to reconsider their previous responses in light of the group's average response. In addition, because the Delphi survey is done at a distance and the participants remain anonymous, no one individual can dominate the discussion. Gucionne[31] recommended that classification schemes should be created using a Delphi consensus of experts. Experts bring current thinking to the issue allowing the author to aggregate knowledge and experience of others.[32] Recently the Delphi process has been employed to try to achieve consensus among expert physical therapists about clinical indicators associated with orthopedic conditions.[33-35] The results provided preliminary validity of these indicators for further use in establishing clinical classifications.

Diagnostic Classifications

The first author created a first draft of the Diagnostic Classifications for Bipedal Locomotion (DCBL) based on a review and critical analysis of existing gait classifications, knowledge of control of bipedal locomotion, clinical experience and several years experience using the framework developed by Patla both in entry-level and continuing PT education. Starting with the requirements described by Patla, the first author decided to also include 3 additional sub tasks of bipedal locomotion in the DCBL. Limb clearance, initiation, and termination, have been identified as key aspects of bipedal locomotion that also have consequences for equilibrium. Trajectory of the swing foot clearance is considered a main task of successful bipedal locomotion.[8,36] Initiation of bipedal locomotion is the point of transition from stance into walking. It requires an active control process and results in a consistent pattern of muscle activation and displacement of the center of mass and center of pressure.[37] Termination is the process of anticipation control and arresting forward momentum.[38] Both movement initiation and termination are considered critical phases of movement analysis.[7,39] The first author also included behavioral and cognitive factors in the DCBL. Dual tasking is the ability to appropriately allocate attention among tasks that are performed simultaneously.[40] It is a component of executive function that can have a unique and significant effect on balance and gait control in the absence of other executive function deficits. Self-efficacy or confidence in one's ability to walk safely can have a large influence on bipedal locomotor behavior. [41-43] Fear of falling (FOF) is a major health problem among the elderly living in communities, whether or not they have fallen previously.[44] Fear of falling was significantly associated with avoidance of everyday activities critical to independence for

community dwelling adults.[45] The consequences of fear of falling were associated with decline in physical and mental performance, an increased risk of falling and progressive loss of health-related quality of life.[44] Last, executive function refers to a variety of higher cognitive processes that use and modify information from many cortical sensory systems to modulate and produce behavior.[40] This includes several cognitive and behavioral processes that are necessary for goal-directed or purposeful activity. Volition is the capacity for intentional behavior including setting goals and initiating action. Self-awareness is the ability to place oneself in the situation. Planning is the ability to identify and organize steps towards a goal. Response inhibition allows one to ignore irrelevant cues and distractions. Response monitoring is the ability to compare actions with a plan to determine if it is being carried out as planned.[40] These processes do not affect the kinematics of gait, but can profoundly affect the ability of locomotion to be used in a purposeful manner. Executive functions are thought to slow with normal aging but true dysfunction is associated with lesions in the frontal lobe.[40]

Recruitment of Participants

The intent for this Delphi survey was to create an expert panel that represented clinicians as well as academic/researchers from the range of disciplines that contribute to the body of knowledge of bipedal locomotion. It was intended that one half of the participants would be academic and/or research physicians, PTs, engineers, biomechanists and scientists. The other half of the participants would be clinicians, primarily physical therapists or physicians. The target number of participants for this Delphi survey was 100. The ideal number of participants for Delphi surveys has not been

identified in the literature. Greater numbers of participants may increase the quality of the consensus, however, over a certain threshold, the benefits do not outweigh the need to manage increased amounts of data. It has been recommended that the number of participants should be based on scope of the problem as well as available resources. Generalizability was a priority of this study because consensus on global classifications of bipedal locomotion is sought so a larger cohort of participants was desirable. In addition, a large number of participants was necessary in order to test the hypotheses about differences between responses of the subgroups of participants, academic/researchers versus clinicians and participants who work with or study adults and those who work with or study children. It was projected that the first author would need to contact 336 potential participants to enroll 112 participants in the study.[46] Enrolling this number of participants would increase the chances that 100 participants will complete all three rounds of the survey.[47,48]

Approval to conduct this study was sought from and granted by the Institutional Review Boards of Northwestern University Feinberg School of Medicine and University of Alabama at Birmingham (Appendix A). Recruitment of participants for the expert panel of this Delphi survey was initiated via e-mail (Appendix B) using purposive sampling (Figure 1). The first author e-mailed members of the editorial board of the two professional gait organizations (Appendix C), the authors, guest editors and manuscript reviewers for the Physical Therapy Journal Jacquelin Perry Special Issue: "Stepping Forward with Gait Rehabilitation.[49] The first author asked them to recommend colleagues with a variety of professional backgrounds that they deemed to be experts in locomotion. The first author also contacted the Center Coordinators of Clinical Education (CCCE) of

the physical therapy (PT) departments of the top 10 rehabilitation[50] and children's[51] (neurology and neurosurgery) hospitals as recognized by US News and World Report (Appendix D). These CCCEs were asked to recommend any PTs from their department that they consider to be experts in locomotion and to meet the inclusion criteria of having 5 or more years of clinical experience and being an American Board of Physical Therapy Specialties certified Geriatric, Neurologic or Pediatric Clinical Specialist. Last, the first author contacted the directors of the Geriatric, Neurologic and Pediatric Residency Programs of the APTA[52] by e-mail and asked them to recommend clinical specialists who are associated with their residency program whom they consider locomotor experts and meet the other inclusion criteria for the clinical experts (Appendix E). Clinical specialists were recruited because they are recognized by the PT profession as demonstrating advanced clinical knowledge, experience, and skills in a special area of practice.[53] Potential participants who currently work with the authors were excluded. Two to three reminders were sent to these individuals. This process netted 228 potential participants.

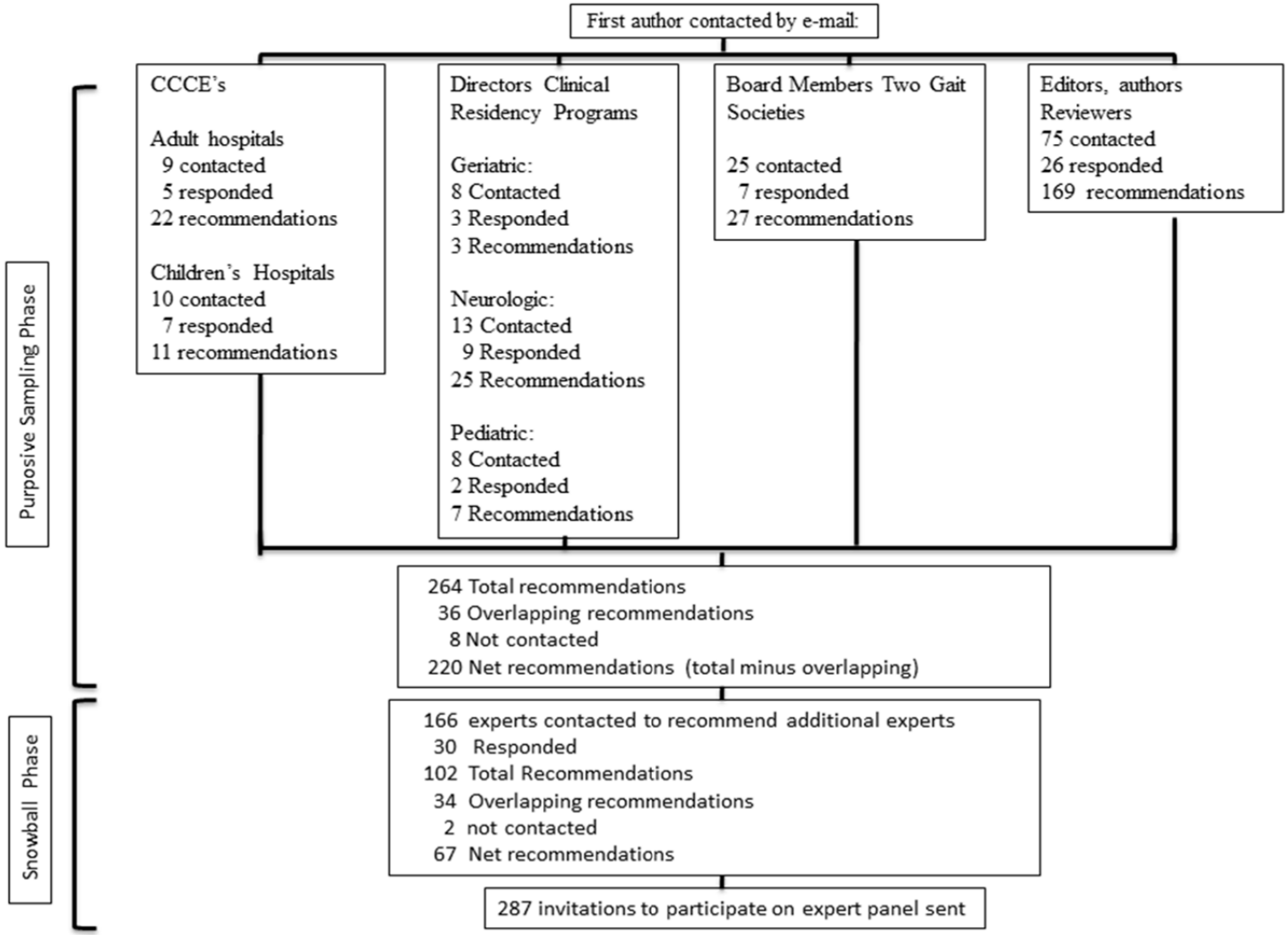

Figure 1. Description of expert panel recruitment

A snowball sampling technique was then used to recruit additional expert panel participants. The first author asked 166 of the experts identified from purposive sampling to recommend colleagues who they believed were experts in locomotion. At this point, the specific criteria for clinical experts were not used assuming that these individuals would look towards credible sources as leaders in locomotion and international so the clinical specialist designation was not applicable. This process resulted in 67 additional potential participants for a total of 287.

Delphi Process

Round 1

Figure 2 illustrates the Delphi Process. To initiate the first round, the first author sent an email via Survey Monkey ™ to each of the 287 identified experts (Appendix F). This email provided an introduction to the purpose, scope, estimated time commitment, and time frame of the study, as well as the importance of committing to the entire process. The email stated that responding to the first survey was considered as the participant giving their consent to participate and that the participant's identity would be confidential. The e-mail message contained a link to the first survey. In the first survey, the respondents were asked to provide demographic information about their age, sex, profession, years in profession, and academic and professional credentials (Appendix G). Participants were asked to rank how they spend their professional time in terms of clinical, research, teaching and to estimate the percentage of total work time that they treat or study locomotion for adults over 18 years of age or children. Participants were

presented with the original 15 diagnostic classification names and description and were asked to respond to the following 4 open-ended questions: “Are there any classifications that you think should be added (removed, reworded, merged)? If so, please describe and provide your rationale.” Participants were also asked for any overall comments about the diagnostic classifications. Diagnostic classification was defined for participants as a fundamental requirement of bipedal locomotion towards which examination and treatment can be directed.

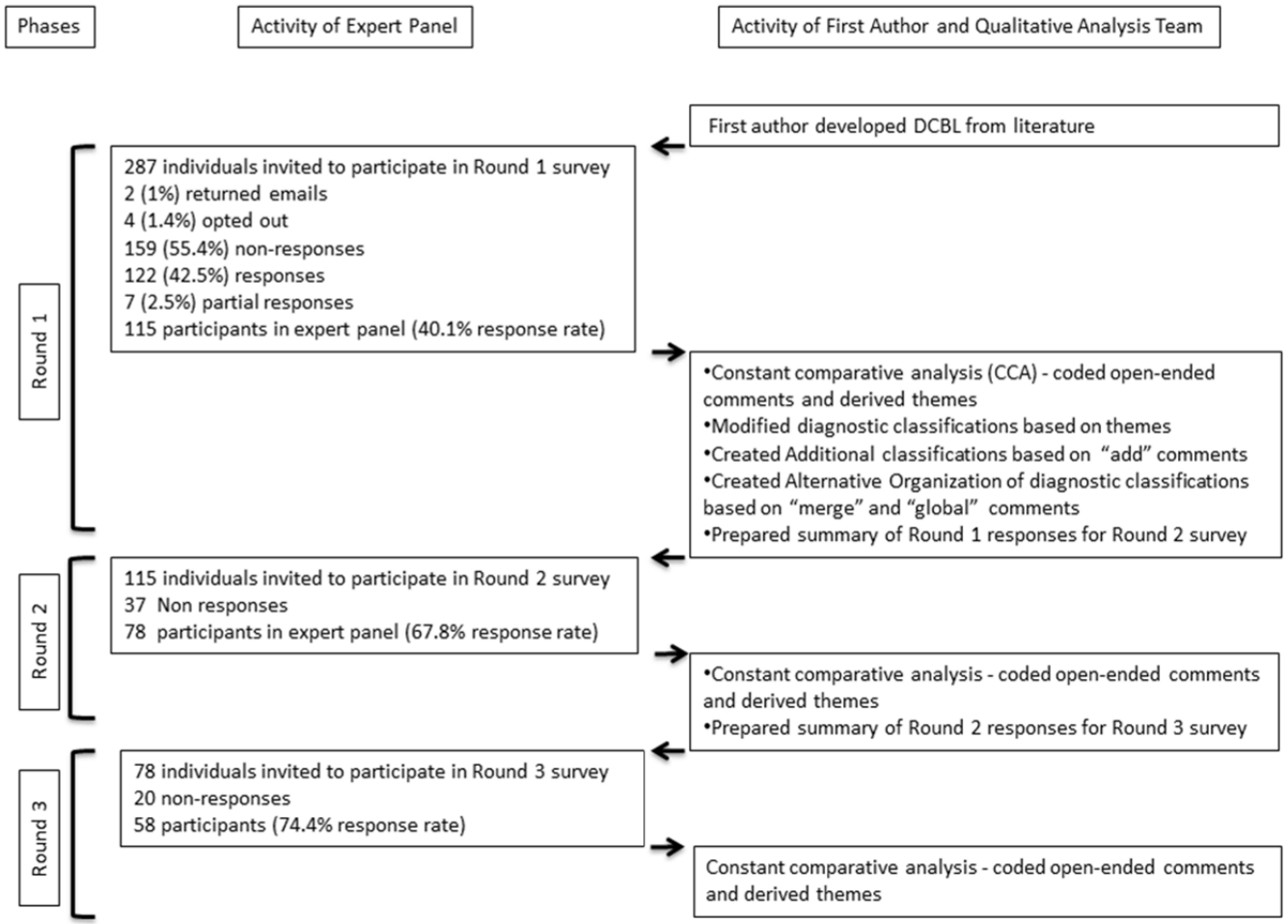

Figure 2. Description of the Delphi process

Round 2

The Round 2 survey contained a summary of the demographics of the Round 1 expert panel, overall response rate and percentage of the experts who responded to each of the Round 1 open ended questions (Appendix H). This was followed by an explanation of the data analysis procedure and a summary of the global comments. A clarification of the need for diagnostic classifications, definition of diagnosis, distinction between locomotion and gait, and purpose of the study was also provided. Each original diagnostic classification was presented with numbers of participants who recommended that it be removed or reworded. The reworded codes and themes were presented followed by the modified name and description. Participants were asked to rate the validity, mutual exclusiveness and understandability of each original and modified classification using a 4 point Likert Scale as well as provide any open-ended response about each classification. Additional diagnostic classifications suggested from Round 1 were then presented and participants were asked to rate them as well. Finally, an alternate organization of all the diagnostic classifications was presented. Because of the length of the survey, participants were offered access to their personal responses from Round 1.

Round 3

The third round survey provided the participants with a summary of the Round 2 panel demographics and global comments (Appendix I). Each original and modified classification was presented along with a summary of the Likert ratings and open-ended comments from Round 2. For Round 3, participants were asked to re-rate the same

classifications after reviewing the group response from Round 2. Individual responses from Round 2 were sent to each panelist in a PDF electronic file.

Participants were given 3 weeks to respond to each round of the survey. Reminder e-mails were sent out one week and 2 days before the deadline and one week after the deadline.

Statistical Analysis

The demographic and Likert responses were downloaded and summarized descriptively. The Wilcoxon Signed-Ranks Test was used to test the difference in participant Likert responses between Rounds 2 and 3 while between subject differences were tested using the Mann Whitney U. A linear weighted Kappa coefficient was calculated to assess intra-rater agreement for Likert responses from Rounds 2 and 3.[54] A significance of $p < 0.05$ was used for all statistical tests. Consensus about the proposed diagnostic classifications was defined a priori as:

- In Round 3 $\geq$ 75% of participants in the Delphi survey agree or strongly agree that each classification represents a valid, mutually exclusive and understandable diagnostic classification for locomotion.[47, 48, 55, 56]
- There will be no statistically significant difference between participant responses in Rounds 2 and 3. (Wilcoxon Signed-Ranks Test ($p \leq .05$))[57]
- Weighted Kappa coefficient will be $\geq .60$ when comparing participant responses to close-ended questions from Rounds 2 and 3.[54, 58]
- There will be a reduction in the percentage of panelists who comment and a convergence of themes between Rounds 1 and 3.[54]

- There will be no statistically significant difference between participant responses in Round 2 between panelists who dropped out following Round 2 versus those who continued to participate through Round 3

The responses to the open-ended questions were downloaded verbatim and de-identified prior to analysis by the qualitative analysis team (QAT). The team consisted of the first author and 2 qualitative analysis experts, one of whom is also a locomotor expert. The team used constant comparative analysis[59] to code each open-ended comment. Each team member coded the comments individually and then the QAT met to arrive at consensus on the codes. The first author derived a draft of the themes with which the QAT reviewed, discussed and arrived at consensus. For Round 1, the themes informed modifications of the names and/or descriptions of the diagnostic classifications. For Round 2, the codes and themes were presented as part of the feedback to participants at the beginning of the Round 3 survey.

RESULTS

Recruitment

The results of the two phases of expert panel recruitment are illustrated in Figure 1. Purposive and snowball recruitment resulted in 287 experts being initially invited to participate in the Delphi survey. The response rates for Rounds 1 – 3 were 115/287 (40.1%), 78/115 (67.8%), and 58/78 (74.4%) respectively. A total of 58 expert panelists participated in all 3 rounds (Figure 2).

The demographics of the expert panel remained relatively stable over the three rounds (Table 1).

Table 1

Demographics of the Expert Panel

	Round 1	Round 2	Round 3
Number of Expert Panelists	115	78	58
Age (years) mean (SD) (range)	44.69 (9.46) (28-72)	43.62 (9.51) (28-72)	44.02 (9.82) (28-72)
Outside USA	9	8	4
PROFESSION:	4 panelists identified dual professions	3 panelists identified dual professions	1 panelist identified dual professions
Biomechanist	4	4	2
Bio(medical)Engineer	7	5	5
Engineer	1	0	0
Gait Researcher	1	1	1
Neuroscientist	2	1	1
Orthopedic Surgeon	1	1	1
Orthotist	1	0	0
Physical Therapist (PT)	91	65	45
Physician (non surgeon)	4	1	1
Professor	2	2	2
Psychologist	1	0	0
Scientist	3	1	1
YEARS IN PROFESSION: mean (SD) (range)	19.08 (9.47) (1.5-45)	17.91 (9.5) (1.5-40)	18.41 (9.53) (2.5 – 40)
TERMINAL ACADEMIC CREDENTIAL:			
Bachelors of Physical Therapy	5	1	1
Masters of Physical Therapy	17	10	7
Doctors of Physical Therapy	22	14	10
Masters degree	7 (5 PT)	4 (4 PT)	4 (2 PT)
Doctoral degree	59 (42 PT)	47 (36 PT)	33 (18 PT)
Medical degree	5	2	2
Certificate in Orthotics	1	0	0
Clinical Specialist (CS)	44	30	21
PRIMARY FOCUS:			
Works primarily as a clinician:	44/115 (38.3%) (28/39 PTs - CS)	27/78 (34.6%) (21/25 PTs - CS)	20/58 (34.5%) (15/19 PTs - CS)
Works primarily as a researcher:	59/115 (51.3%) (11/41 PTs – CS)	42/78 (53.8%) (6/29 PTs – CS)	30/58 (51.7%) (4/19 PTs – CS)
Works as clinician and researcher equally:	12/115 (10.4%) (5/10 PTs – CS)	9/78 (11.5%) (3/8 PTs – CS)	8/58 (13.8%) (2/7 PTs – CS)
Works primarily with adults (> 18 years):	85/115 (73.91%)	58/78 (74.36%)	43/58 (74.1%)
Works primarily with children:	24/115 (20.87%)	17/78 (21.79%)	12/58 (20.7%)
Works with adults and kids equally:	6/115 (5.22%)	3/78 (3.85%)	3/58 (5.2%)

For Round 3, the overwhelming majority of the panelists (79.3%) were physical therapists with several engineers and a few physicians and other researchers represented.

Nearly 60 percent (56.9%) of the experts had earned a doctoral academic degree. Just over half (51.7%) of the panelists identified themselves as primarily researchers and 34.5% self-identified primarily as clinicians. The majority of the expert panelists (74.1%) indicated that they worked mostly with adults while 20.7% stated that they worked primarily with children. The mean number of years as professionals was 18.41. The majority (71.8%, 84%, and 78.9%) of clinicians who were physical therapists were certified as clinical specialists for Rounds 1-3 respectively.

Qualitative Results

Round 1

Open-ended comments were coded by the QAT as "remove" or "reword" if they were pertinent to a specific classification (Table 2). While 28% of expert panelists recommended removing one or more of the classifications, less than 8% of the panelists recommended removal of any one classification. For five of the diagnostic classifications there were no recommendations for removal.

Table 2

Description of Original and Modified Classifications and the Themes Generated in Each Round

Round 1 **n = 115**			**Round 2** **n = 78**	**Round 3** **n = 58**
Original Classifications (OC):	**Recommendations:**	**Modified Classifications (MC):**	**Comments:**	**Comments:**
NAME: Initiation DESCRIPTION: Planned transition from quiet standing to walking	n = 2 Remove: n = 0 Reword: n = 2 Themes: Description: drop "planned	NAME: Initiation DESCRIPTION: Transition from quiet standing to walking	n = 22 Themes: prefer MC	n = 9 no additional themes

NAME: Termination DESCRIPTION: Planned transition from walking to quiet standing	n = 2 Remove: n = 0 Reword: n = 2 Themes: Description: drop "planned	NAME: Termination DESCRIPTION: Transition from walking to quiet standing	n = 16 Themes: • prefer MC	n = 10 no additional themes
NAME: Rhythmical Limb Movement DESCRIPTION: Manifestation of core locomotor pattern	n = 21 Remove: n = 2 Reword: n = 19 Themes: Name: include stepping &/or coordination Description: • clarify • include symmetry & arm swing	NAME: Coordination of Rhythmical Stepping and Arm Swing DESCRIPTION: Reciprocal and symmetrical upper and lower extremity motion during walking	n = 22 Themes: • prefer MC • overlap construct	n = 21 no additional themes
NAME: Anti-Gravity Support DESCRIPTION: Generation of torques in stance limb and trunk sufficient to withstand gravity	Remove: n = 1 Reword: n = 13 Themes: Name: include stability & stance	NAME: Stance Stability DESCRIPTION: Generation of torques in trunk and limbs sufficient for stance stability	n = 27 Themes: • construct clarity	n = 21 no additional themes
NAME: Active Propulsion DESCRIPTION: Generation of torques primarily in the ankle to	Remove: n = 2 Reword: n = 15 Themes: Name: include progression/advance ment Description: broaden beyond ankle	NAME: Progression During Stance DESCRIPTION: Generation of torques to accelerate body center of mass in direction of locomotion accelerate body center of mass in forward direction	n = 30 Themes: • clarity construct	n = 17 no additional themes
NAME: Foot Clearance DESCRIPTION: Trajectory of the swinging foot such that it clears the support surface	Remove: n - 0 Reword: n = 11 Themes: Name: Broaden beyond foot Description: trajectory not as important as ability of limb to clear	NAME: Swing Limb Advancement DESCRIPTION: Ability to lift the swing limb clear of the support surface to progress it in the direction of locomotion	n = 27 Themes: • prefer MC construct	n = 19 no additional themes
NAME: Proactive Dynamic Equilibrium DESCRIPTION: Production of balance responses that are implemented for the expected perturbations accompanying walking and any other concurrent	Remove: n = 1 Reword: n = 16 Themes: Name: "anticipatory" and "balance" instead of "proactive" and "equilibrium" Description:	NAME: Anticipatory Dynamic Balance DESCRIPTION: Postural adjustments in preparation for expected perturbations accompanying walking in order to achieve dynamic equilibrium	n = 16 Themes: • prefer MC	n = 10 no additional themes

movements made during walking	differentiate from Steering & Accommodation and Reactive Dynamic Equilibrium			
NAME: Reactive Dynamic Equilibrium DESCRIPTION Detection of unexpected perturbations from stimulated sensory systems and subsequent correction/stabilization	Remove: n = 1 Reword: n = 10 Themes: Name: balance" instead of "equilibrium"	NAME: Reactive Dynamic Balance DESCRIPTION: Detection of and response to unexpected perturbations that occur during walking in order to achieve dynamic equilibrium	n = 16 Themes: • prefer MC	n = 15 no additional themes
NAME: Steering and Accommodation DESCRIPTION: Adaptation of gait to accommodate or avoid environmental or other contextual demands	Remove: n = 0 Reword: n = 25 Themes: Name: prefer “adaptability” Description: specify meaning of environment and context	NAME: Adaptability DESCRIPTION: Ability to adjust gait to accommodate changes in physical environment (eg. unlevel terrain, obstacles, slippery conditions) or other contextual demands (eg. crowds, being in a hurry) that require a change in direction, path or speed	n = 16 Themes: • overlap	n = 14 no additional themes
NAME: Spatial Mapping DESCRIPTION: Perceptual representation of large scale areas	Remove: n = 2 Reword: n = 17 Themes: • define more clearly	NAME: Navigation to Unseen Locations DESCRIPTION: Visual perceptual representation of large scale areas to allow pathfinding to known, but unseen locations	n = 27 Themes: • clarity construct	n = 20 no additional themes
NAME: Dual Task Capacity DESCRIPTION: Appropriate allocation of attention among simultaneous tasks	Remove: n = 0 Reword: n = 9 Themes: Name: “Multi” instead of “Dual” task Description: Broaden types and number of secondary tasks	NAME: Multi Task Capacity DESCRIPTION: Appropriate allocation of attention among psychomotor and/or cognitive tasks that are carried out while walking	n = 18 Themes: • prefer MC	n = 14 no additional themes
NAME: Balance Confidence DESCRIPTION: Self-perceived walking capability	Remove: n = 3 Reword: n = 21 Themes: Name: “Walking” instead of “Balance” to match description	NAME: Walking Confidence DESCRIPTION: Self-perceived walking capability (no change)	n = 17 Remove: n = 1 Themes: • prefer MC	n = 12 no additional themes

NAME: Purposefulness DESCRIPTION: Set goal; initiate and achieve goal as planned	Remove: n = 9 Reword : n =11 Themes: Description: unclear	NAME: Purposefulness DESCRIPTION: Ability to utilize locomotion as part of a plan to achieve a set goal	n = 17 Remove: n = 3 Themes: • clarity • overlap	n = 13 no additional themes
NAME: Energy Cost DESCRIPTION: Cardiovascular and respiratory demands associated with locomotion	Remove: n = 1 Reword: n = 11 Themes: Want muscle encompassed in name and description	NAME: Metabolic Energy Expenditure DESCRIPTION: Energy demand and resources sufficiently matched to achieve locomotor goals	n = 24 Themes: Themes: • clarity	n = 17 no additional themes
NAME: Long-Term Viability DESCRIPTION: Stress on musculoskeletal system during locomotion	Remove: n = 5 Reword: n = 23 Themes: Name: Do not like the term viability Description: too vague	NAME: Long-term Musculoskeletal Integrity DESCRIPTION: Ability of musculoskeletal system to withstand the demands of locomotion over the lifespan	n = 14 Themes: • clarity	n = 17 no additional themes

"Reword" coded comments were further coded as "new name," "new description," "clarification," "concepts to include," "terminology," "subdivide" or "measures to quantify." Themes were developed from the coded comments for each classification. These themes informed the modifications of names and/or descriptions of the diagnostic classifications by the QAT (Table 2). Seventy-five percent of panelists recommended rewording one or more classification names and/or descriptions. All but two classification names (Initiation and Termination) and one classification description (Balance Confidence) were revised by the QAT. The diagnostic classifications fell into three groups according to the scope of the recommendations for modification. Relatively straightforward changes in terminology, descriptions and definitions were recommended for Initiation, Termination, Proactive and Reactive Dynamic Equilibrium, Steering and Accommodation, Dual Task Capacity, Balance Confidence and Energy Cost. In contrast, lack of clarity was the primary theme for Spatial Mapping, Purposefulness, and Long-

Term Viability necessitating more substantial modifications. The QAT faced the most difficult task in modifying Rhythmical Limb Movement, Antigravity Support, Active Propulsion and Limb Clearance because of panelists' concerns about clarity as well as construct – concepts included in the classification.

Open-ended responses that were not associated with a specific classification were coded as "addition," "merge," or "global." 60.8 % of panelists recommended adding one or more classifications. Twenty (22%) panelists suggested 12 different merge combinations of 2 to 3 classifications. Global comments from 58 panelists (50.4%) were recoded and the following themes were created: 1) "Positive" (n = 19) - Many panelists expressed general positive comments as well as more specific expressing that they perceived the DCBL to be clinically relevant and comprehensive because it considered dimensions beyond traditional gait analysis; 2) "Purpose" (n = 12) - Some panelists questioned how the DCBL was meant to be used and wanted to understand if it was intended to replace traditional gait analysis. Some panelists did not understand the need for classifications beyond traditional gait analysis. 3) "Clinical Utility" (n=10) - Some panelists expressed concerns about the length and complexity of the classifications as well as therapists' ability to understand and willingness to adopt the terminology; 4) "Need for restructuring of framework" (n =7) - Some panelists could not understand what held the classifications together and suggested providing an organizing framework for the diagnostic classifications to make the theoretical construct evident. 5) "Measurement/quantification issues" (n= 6) - This theme reflected a concern of panelists over how the classifications could be quantified. Many expressed doubt about the measurability of several classifications and some linked potential for measurability with

validity; 6) “Overall definitions of classifications and diagnosis” (n = 5) - Several global comments reflected uncertainty about “definitions of classifications and diagnosis”

In preparation for Round 2, the QAT grouped the “addition” recommendations into the following categories: temporal and spatial characteristics of walking, kinematics of walking, kinetics, impairments, and arm swing and developed 6 additional diagnostic classifications for rating in Round 2. (Table 3) The QAT also developed an alternative organization of the diagnostic classifications for comment in Round 2. (Table 4) The QAT decided to provide a clarification of the need for diagnostic classifications, the definition of diagnosis in this context, and define the distinction between locomotion and gait at the beginning of the Round 2 survey. The introduction to Round 2 also reiterated the purpose and scope of the study to limit subsequent comments about measurement and clinical utility that were outside the scope of the study.

Table 3

Additional Bipedal Locomotor Classifications Created by QAT Based on Recommendations of Expert Panel in Round 1

NAME: Joint and Segmental Kinematics of Gait DESCRIPTION: Position, displacement, velocity and acceleration of the body segments during walking often organized by the phases of gait. NAME: Temporal and Spatial Descriptors of Gait DESCRIPTION: Temporal and spatial measures of gait cycle and/or observations about quality of gait pattern. NAME: Standing Stability DESCRIPTION: Capacity to attain upright posture and maintain standing balance NAME: Kinetics of Gait DESCRIPTION: Forces applied across joints, moments generated by muscles and mechanical power and energy generated during walking. NAME: Endurance DESCRIPTION: Distance or temporal measures of maximal continuous walking NAME: Body Structures and Function DESCRIPTION: Alterations at the body structure and function level related to walking

Table 4

Alternative Organization of DCBL Created by the QAT Based on Recommendations from the Expert Panel in Round 1

Alternative Organization of DCBL
Transitions
Initiation
Termination
Stance
Stance Stability
Progression During Stance
Interlimb and Intralimb Coordination
Coordination of Rhythmical Stepping and Arm Swing
Swing Limb Advancement
Balance
Anticipatory Dynamic Balance
Reactive Dynamic Balance
Task and Environmental Context
Adaptability
Navigation to Unseen Locations
Multi Task Capability
Walking Confidence
Purposefulness
Sustainability
Metabolic Energy Expenditure
Long-Term Musculoskeletal Integrity

Round 2

Open-ended comments about specific diagnostic classifications were coded as "preference," "construct," "overlap," "clarify," "terminology," "specific recommendation," "clinical utility," and "general comment." Themes were derived but the classification names and descriptions were not further modified for Round 3. A major theme for 8 of the classifications was that the panelists preferred the modified version.

Issues of clarity persisted for several classifications from Round 1 and became a new theme for Anti-Gravity Support/Stance Stability, Active Propulsion/Progression During Stance, and Energy Cost/Metabolic Energy Expenditure. Similarly, construct continued to be a concern for several classifications from Round 1 and became a theme for Spatial Mapping/Navigation to Unseen Locations.

The global themes of purpose, clinical utility underlying theoretical framework and measurement/quantification persisted in Round 2 despite the attempt to clarify these issues at the beginning of the Round 2 survey. One additional theme was "overlap between classifications." Open-ended comments about the additional classifications were minimal and were coded as "purpose," "clinical utility," "overlap," and "difficulty with survey." Thirty-three of the 39 panelists who commented on the alternative organization of the diagnostic classifications, commented that it was a positive change, specifically more understandable and useful.

Round 3

No additional themes were derived from the comments in Round 3 about individual classifications (Table 2). There was not a reduction in the percentage of panelists who commented on most classifications between Rounds 1 and 3. In general, there was a convergence of themes between Rounds 1 and 3 for several classifications where the modified version was preferred. For others, the themes of clarity and construct remained similar between rounds.

Global comments were minimal and were coded as positive (n = 2), need for theoretical construct (n = 1) Purpose (n = 1) Measurement (n = 2) Clinical Utility (n = 2)

Wording (n = 3) Pathology (n = 1). The majority of the major themes that developed in Round 1 persisted through Round 3 so there was not a convergence, however, there was a significant reduction in the percentage of panelists who provided global comments in Round 3 (22.4%) as compared with Round 1 (50.4%). There were no additional themes generated by comments about the alternative organization or the additional classifications.

Likert Responses – Rounds 2 and 3

In Round 3, 75% or more panelists strongly agreed or agreed about the validity, mutual exclusivity and understandability of 2 of the original diagnostic classifications (Table 5) and 5 of the modified classifications (Table 6). In all, 75% or more panelists strongly agreed or agreed about the validity of 7 of the other modified diagnostic classifications and either their mutual exclusivity or understandability. There was no consensus about the validity of Navigation to Unseen Locations, Purposefulness or Long-Term Musculoskeletal Integrity.

Table 5

Round 3 Likert Responses for Original Bipedal Locomotor Classifications

Classification	Validity			Mutual Exclusivity			Understandability		
	n	Strongly Agree or Agree	Disagree or Strongly Disagree	n	Strongly Agree or Agree	Disagree or Strongly Disagree	n	Strongly Agree or Agree	Disagree or Strongly Disagree
1. Initiation	58	84.5%*	15.5%	57	91.2%*	8.8%	58	81.0%*	18.9%
2. Termination	57	92.9%*	7.1%	58	93.1%*	6.9%	58	84.5%*	15.5%
3. Rhythmical Limb Movement	58	70.7%	29.3%	58	56.9%	43.1%	57	35.1%	64.9%
4. Anti-Gravity Support	58	72.4%	27.5%	57	68.4%	31.6%	58	56.9%	43.1%
5. Active Propulsion	57	70.2%	29.9%	56	64.3%	35.8%	57	56.1%	43.8%
6. Foot Clearance	57	80.7%*	19.3%	57	70.2%	29.9%	58	70.7%	29.3%
7. Proactive Dynamic Equilibrium	57	64.9%	35.1%	57	54.4%	45.7%	58	36.2%	63.8%
8. Reactive Dynamic Equilibrium	58	68.9%	31.0%	58	55.2%	44.8%	58	43.1%	56.9%
9. Steering and Accommodation	58	67.3%	32.7%	58	50.0%	50.0%	57	52.7%	47.4%
10. Spatial Mapping	57	54.4%	45.6%	57	57.9%	42.2%	57	28.1%	71.9%
11. Dual Task Capacity	58	84.5%*	15.5%	58	72.4%	27.6%	58	75.8%*	24.1%
12. Balance Confidence	58	62.1%	37.9%	57	66.7%	33.4%	58	75.9%	24.1%
13. Purposefulness	57	66.6%	33.4%	57	57.9%	42.1%	57	52.6%	47.4%
14. Energy Cost	56	91.0%*	8.9%	56	85.7%*	14.3%	56	73.2%	26.8%
15. Long Term Viability	57	54.4%	45.6%	57	68.5%	31.6%	57	43.9%	56.1%

** greater than 75% panelists strongly agreed or agreed*

Table 6

Round 3 Likert Responses for Modified Bipedal Locomotor Classifications

Classification	Validity			Mutual Exclusivity			Understandability		
	n	Strongly Agree or Agree	Disagree or Strongly Disagree	n	Strongly Agree or Agree	Disagree or Strongly Disagree	n	Strongly Agree or Agree	Disagree or Strongly Disagree
1. Initiation	58	94.8%*	5.1%	58	91.4%*	8.6%	58	94.8%*	5.1%
2. Termination	58	93.1%*	6.9%	58	93.1%*	6.9%	57	91.2%*	8.8%
3. Coordination of Rhythmical Stepping and Arm Swing	57	87.9%*	12.0%	57	80.7%*	19.3%	58	74.1%	25.8%
4. Stance Stability	58	89.6%*	10.4%	58	72.4%	27.6%	58	75.8%*	24.1%
5. Progression During Stance	56	80.3%*	29.7%	56	69.6%	30.4%	57	70.1%	29.9%
6. Swing Limb Advancement	55	89.0%*	10.9%	56	71.4%	28.6%	57	75.4%*	24.6%
7. Anticipatory Dynamic Balance	57	91.2%*	8.8%	58	79.3%*	20.7%	58	82.7%*	17.2%
8. Reactive Dynamic Balance	58	86.2%*	13.8%	58	74.2%	25.8%	58	84.5%*	15.5%
9. Adaptability	57	90.2%*	8.8%	58	69.0%	31.0%	57	93.0%*	7.1%
10. Navigation to Unseen Locations	56	66.1%	34.0%	57	68.4%	31.6%	57	49.1%	50.9%
11. Multi Task Capacity	58	93.1%*	6.9%	58	79.3%*	20.7%	58	84.5%*	15.5%
12. Walking Confidence	57	83.5%*	17.6%	58	79.4%*	20.7%	58	84.5%*	15.5%
13. Purposefulness	57	68.4%	31.6%	58	63.8%	36.2%	57	77.2%*	22.9%
14. Metabolic Energy Expenditure	57	91.2%*	8.8%	56	83.9%*	16.1%	57	63.2%	38.8%
15. Long Term Musculoskeletal Integrity	57	68.4%	31.6%	57	77.2%*	22.8%	56	80.4%*	19.7%

** greater than 75% panelists strongly agreed or agreed*

There was no statistically significant difference between participant responses in Rounds 2 versus 3. The only linear weighted Kappa value that exceeded .6 was for validity of the modified Termination classification (.67) (Table 7). A comparison of the Round 2 ratings between panelists who dropped out after Round 2 versus those who continued to participate through Round 3 revealed statistically significant differences only for mutual exclusivity of Coordination of Rhythmical Stepping and Arm Swing ($p = .032$) and understandability of Multi-Tasking ($p = .047$). No consensus was reached for

the validity, mutually exclusivity and understandability of any of the additional diagnostic classifications (Table 8).

Table 7

Linear Weighted Kappa Values for Rounds 2 and 3

Classification	Validity	Mutual Exclusivity	Understandability
1. Initiation	.49	.34	.29
2. Termination	.67	.42	.38
3. Coordination of Rhythmical Stepping and Arm Swing	.35	.36	.27
4. Stance Stability	.47	.18	.16
5. Progression During Stance	.27	.28	.13
6. Swing Limb Advancement	.48	.28	.30
7. Anticipatory Dynamic Balance	.38	.26	.35
8. Reactive Dynamic Balance	.44	.21	.23
9. Adaptability	.30	.14	.29
10. Navigation to Unseen Locations	.36	.10	.29
11. Multi Task Capacity	.26	.35	.20
12. Walking Confidence	.53	.42	.34
13. Purposefulness	.42	.12	.41
14. Metabolic Energy Expenditure	.09	.23	.24
15. Long Term Musculoskeletal Integrity	.41	.30	.26

Table 8

Round 3 Likert Responses for Additional Bipedal Locomotor Classifications

Classification	Validity			Mutually exclusivity			Understandability		
	n	Strongly Agree or Agree	Disagree or Strongly Disagree	n	Strongly Agree or Agree	Disagree or Strongly Disagree	n	Strongly Agree or Agree	Disagree or Strongly Disagree
Joint Segmental Kinematics Gait	56	78.6%*	21.4%	57	47.3%	52.6%	56	73.2%	26.8%
Temporal Spatial Descriptors of Gait	57	84.2%*	15.8%	57	49.1%	50.9%	57	68.4%	31.6%
Standing Stability	57	47.3%	52.6%	57	45.6%	54.4%	56	67.8%	32.1%
Kinetics of Gait	56	73.2%	26.8%	56	39.3%	60.7%	57	72.0%	28.1%
Endurance	56	80.3%*	19.7%	55	43.6%	56.4%	56	69.6%	30.4%
Body Structures Function	57	21.1%	79.0%	56	14.3%	85.7%	57	22.8%	77.2%

** greater than 75% panelists strongly agreed or agreed*

Secondary Results

In Round 3 there was no statistically significant difference in ratings between panelists who identified themselves primarily as clinicians versus researchers. There was a statistically significant difference between the ratings of the panelists in Round 3 who worked with adults versus children for validity of the modified Initiation ($p = .01$), modified Termination ($p = .02$), Adaptability ($p = .05$) and Walking Confidence ($p = .01$) as well as for understandability of Walking Confidence ($p = .01$).

DISCUSSION

This is the first time that locomotor experts have been bought together in an attempt to reach consensus on the fundamental requirements of bipedal locomotion. When presented in the context of a modified Delphi survey with 15 diagnostic classifications developed from the literature by the first author, the expert panel recommended modifications to all of them. Within 3 rounds, the panel reached full consensus on 5 of the modified diagnostic classifications using Likert ratings. The panel reached partial consensus on 6 additional modified classifications. Consensus was also demonstrated by the overall lack of statistically significant difference between the ratings in Rounds 2 and 3. Another measure of consensus was that there was a decrease in the percentage of panelists who made global comments between Rounds 1 and Round 3 even though the themes that emerged from their comments did not converge appreciably. The numbers of comments about individual classifications did not decrease and in many cases an increased percentage of panelists commented in the later Round. It appeared to the QAT that many panelists were responding to the comments of other panelists from previous rounds. Interestingly, the increase in comments was not limited to those classifications where clarity and construct were issues, but for ones where there was a clear preference for the modified version. Another measure that indicated that panelists were changing their ratings between the rounds 2 and 3 was the fair to moderate linear weighted Kappa values.

The viewpoint of the panelists who drop out of a Delphi survey may be as important as that of those who complete all rounds. A concern may be that individuals drop out because they perceive their perspective to be significantly different from the mainstream. The lack of statistically significant difference in the Likert ratings of the panelists who dropped out after Round 2 versus those who continued to participate through Round 3 did not support this possibility.

There was no difference between the ratings of experts who were primarily clinicians and researchers. The significant differences in the ratings of panelists who work with adults versus children about the validity of 4 classifications may reflect the diverse perspectives these professionals have about classifying bipedal locomotion based on their general experience with the respective populations as well as applying established age-specific classifications systems. It may be that a single bipedal locomotor classification system cannot encompass walking dysfunction across the entire age span.

Similar trends were seen in both the qualitative themes derived from the open-ended comments and the quantitative ratings of the individual classifications indicating a correspondence between the two types of panelist responses. Likert rating consensus was completely achieved for the classifications where the primary theme in Round 2 was "prefer modified version." In contrast, themes of clarity, construct and overlap characterized the classifications that did not reach full consensus. Full consensus was achieved for Initiation, Termination, Anticipatory Dynamic Balance, Multi Task Capacity, and Walking Confidence. This is not surprising given that these areas are typically related to walking even though not always included in traditional gait analysis. It is notable that concerns about clarity and construct and were evident for the

classifications that were closest to traditional gait analysis phases; Stance Stability, Progression During Stance and Swing Limb Advancement. Perhaps because panelists had the most expertise in these areas, they scrutinized them more critically and or were less willing to create a new version of them. The reasons for lack of consensus for three classifications varied. Some panelists expressed confusion about the construct underlying Navigation to Unseen Locations whereas the relevance of Purposefulness to a locomotor classification system was not clear and the description of Metabolic Energy Expenditure lacked consensus.

The relatively large size of the expert panel that completed all 3 rounds and the fact that the panel included both clinicians and researchers as well as those who work with adults and children was a strength of the study because it enabled a broad representation of opinions, which was beneficial given the breadth of their task. Another strength was that the expert panel was relatively highly educated, experienced and many held clinical specialist certification. Many of the panelists seemed very engaged in the process as evidenced by the number of open-ended responses, the depth of many comments, references back to comments from previous rounds as well as the high response rates for Rounds 2 and 3. The fact that this study used several measures of consensus also helps increase confidence that consensus was reached. The expertise and diverse backgrounds of the QAT members also strengthened the study. Two members of the QAT were experts in qualitative analysis. One member had no familiarity with the locomotor classifications or Patla's requirements. Finally the QAT was responsive to questions that the experts expressed in Round 1 and provided additional information for them.

The low (40.1%) response rate in the first round survey is a limitation of the study. Original recruitment projections were based on studies that recruited only PTs as expert panelists, whereas in this study, recruitment solicited panelists from a range of professions. Experts outside the PT profession may have felt less compelled to participate in a study led by a PT, especially one unknown to them. A second limitation was the length of the survey. Surveys 2 and 3 contained 110 questions because panelists were asked to rate the 15 original, 15 modified and 6 additional classifications on 3 constructs plus 2 open-ended questions. The 6 month and 4 day overall time frame of the 3 rounds was a lengthy period of time to maintain panelists' focus and motivation and may have contributed to the drop out rate. Surveys 1 and 2 generated a significant amount of qualitative data to process and that contributed to the long time periods between surveys. The decision to provide panelists with their individual responses from the previous round may have contributed to individuals simply repeating their responses rather than using them to compare their responses to the group responses. The Survey Monkey format was not optimal for the amount of information that needed to be presented to panelists. Data could not be presented in a table format, and so the panelist's job was made harder by the need to scroll to find information. Finally, the process was concluded at the end of Round 3 even though the expert panel not reach consensus on all of the classifications. Ideally the survey may have continued with a 4th round to see if consensus was possible. Concern about panel fatigue and associated low response rate were the reasons we stopped at 3 rounds.

To our knowledge this is the first attempt to achieve consensus amongst experts about fundamental requirements of bipedal locomotion as a basis for diagnostic classifications

for bipedal locomotor dysfunction. As such, this study provides a model for the development of needed diagnostic classification systems for our profession and represents an initial step towards "disabling the diagnosis dilemma" of PT as described by Coffin-Zadai.[60] One of the expert panelists described this study as "starting the conversation." This conversation is, in part, about broadening the focus of the analysis of walking dysfunction from gait to locomotion. Gait analysis is a critically important skill for PTs but gait classifications based solely on gait analysis are not sufficiently broad enough to help understand why many people experience difficulty walking in the environment. They therefore do not guide clinical decision-making, a critical attribute of the PT diagnostic process.[61]

The results of this study provide initial face and content validity for several of the bipedal locomotor classifications. Further work is needed to establish the validity of the classifications. A version of the modified classifications from this study with explicit operational definitions for all terms needs to be evaluated by focus groups consisting of experts from multiple disciplines as well as from specific professional backgrounds. Then the process of identifying and testing quantitative and qualitative clinical measures for each of the classifications can be pursued with the goal of developing a clinically feasible and systematic diagnostic assessment tool for PTs to categorize locomotor problems so that hypotheses about underlying causes and decisions about further examination and treatment can be organized. Consensus about standardized terminology could also serve to simplify communication between caregivers and third party payers. This clinical tool could be analogous to the original BESTest[62] and could be considered a potential classification system for posture and balance.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL FORM

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Institutional Review Board for Human Use

Form 4: IRB Approval Form
Identification and Certification of Research
Projects Involving Human Subjects

UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The Assurance number is FWA00005960 and it expires on August 29, 2016. The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56.

Principal Investigator: HEDMAN, LOIS D

Co-Investigator(s):

Protocol Number: **E111212001**

Protocol Title: *Diagnostic Classifications for Bipedal Locomotion*

The above project was reviewed on 12-22-11. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This project qualifies as an exemption as defined in 45CF46.101, paragraph 2.

This project received EXEMPT review.

IRB Approval Date: 12-22-11

Date IRB Approval Issued: 12-22-11

Marilyn Doss

Marilyn Doss, M.A.
Vice Chair of the Institutional Review
Board for Human Use (IRB)

Investigators please note:

IRB approval is given for one year unless otherwise noted. For projects subject to annual review research activities may not continue past the one year anniversary of the IRB approval date.

Any modifications in the study methodology, protocol and/or consent form must be submitted for review and approval to the IRB prior to implementation.

Adverse Events and/or unanticipated risks to subjects or others at UAB or other participating institutions must be reported promptly to the IRB.

470 Administration Building
701 20th Street South
205.934.3789
Fax 205.934.1301
irb@uab.edu

The University of
Alabama at Birmingham
Mailing Address:
AB 470
1530 3RD AVE S
BIRMINGHAM AL 35294-0104

APPENDIX B

RECRUITMENT EMAILS

Leaders of Gait and Clinical Movement Analysis Society

Dear Colleague,

My name is Lois D. Hedman, PT, MS. I am a physical therapist, an Associate Professor in the Department of Physical Therapy and Human Movement Sciences, Northwestern University Feinberg School of Medicine and doctoral student in the Department of Physical Therapy at the University of Alabama, Birmingham. I am contacting you to ask for your help in identifying colleagues to participate in the expert panel of the Delphi survey that I am conducting for my dissertation. The goal of the survey is to develop valid diagnostic classifications for bipedal locomotion that can be used as a basis for creating an assessment tool for classifying locomotor movement dysfunction.

The validity of the diagnostic classifications will be established by expert consensus achieved through the Delphi survey process. A Delphi Survey is a group facilitation process that endeavors to reach consensus amongst a group of knowledgeable individuals through a series of structured surveys. The process transforms individual opinions into group consensus by feeding back the group results to all individuals in each subsequent survey. The Delphi survey will be conducted entirely online via Survey Monkey. It is anticipated that 3 survey rounds will be necessary to achieve consensus and will take 4-5 months to complete.

I plan to include 100 expert participants for the survey. I am asking your help in identifying colleagues who you consider to be experts in locomotion. I am interested in recruiting a broad cross-section of physical therapists and physicians who are either primarily clinicians or researchers, and other scientists who conduct locomotor research. I am interested in recruiting individuals who work with adults as well as children.

If you think of colleagues who meet those criteria please send their contact information (name and e-mail address) to me at this e-mail address: l-hedman@northwestern.edu.

Thank you in advance for your consideration of my request. Please feel free to contact me with any questions.

Best Regards,

Lois D. Hedman, PT, MS

Leaders of International Society of Posture and Gait Research

Dear Colleague,

My name is Lois D. Hedman, PT, MS. I am a physical therapist, an Associate Professor in the Department of Physical Therapy and Human Movement Sciences, Northwestern University Feinberg School of Medicine and doctoral student in the Department of Physical Therapy at the University of Alabama, Birmingham. I am contacting you to ask for your help in identifying colleagues to participate in the expert panel of the Delphi survey that I am conducting for my dissertation. The goal of the survey is to develop valid diagnostic classifications for bipedal locomotion that can be used as a basis for creating an assessment tool for classifying locomotor movement dysfunction.

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If you think of colleagues who meet those criteria please send their contact information (name and e-mail address) to me at this e-mail address: l-hedman@northwestern.edu.

Thank you in advance for your consideration of my request. Please feel free to contact me with any questions.

Best Regards,

Lois D. Hedman, PT, MS

Authors, guest editors and manuscript reviewers for the February, 2010 Jacquelin Perry special issue of the Physical Therapy Journal

Dear Colleague,

My name is Lois D. Hedman, PT, MS. I am a physical therapist, an Associate Professor in the Department of Physical Therapy and Human Movement Sciences, Northwestern University Feinberg School of Medicine and doctoral student in the Department of Physical Therapy at the University of Alabama, Birmingham. I am contacting you to ask for your help in identifying colleagues to participate in the expert panel of the Delphi survey that I am conducting for my dissertation. The goal of the survey is to develop valid diagnostic classifications for bipedal locomotion that can be used as a basis for creating an assessment tool for classifying locomotor movement dysfunction.

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If you think of colleagues who meet those criteria please send their contact information (name and e-mail address) to me at this e-mail address: l-hedman@northwestern.edu.

Thank you in advance for your consideration of my request. Please feel free to contact me with any questions.

Best Regards,

Lois D. Hedman, PT, MS

Center Coordinators of Clinical Education of Adult Rehabilitation Hospitals

Dear Colleague,

My name is Lois D. Hedman, PT, MS. I am a physical therapist, an Associate Professor in the Department of Physical Therapy and Human Movement Sciences, Northwestern University Feinberg School of Medicine and doctoral student in the Department of Physical Therapy at the University of Alabama, Birmingham. I am contacting you to ask for your help in identifying colleagues to participate in the expert panel of the Delphi survey that I am conducting for my dissertation. The goal of the survey is to develop valid diagnostic classifications for bipedal locomotion that can be used as a basis for creating an assessment tool for classifying locomotor movement dysfunction.

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I plan to include 100 expert participants for the survey. I am recruiting physical therapists and physicians who are either primarily clinicians or researchers, and other scientists who conduct locomotor research. I am interested in recruiting individuals who work with adults as well as children.

I am asking your help in identifying physical therapist colleagues from your department who you consider to be experts in locomotion. The only requirements are that the individuals are American Board of Physical Therapy Specialties certified Neurologic or Geriatric Clinical Specialists and have a minimum of 5 years of clinical experience. You may identify yourself as such an expert.

If you think of colleagues who meet those criteria please send their contact information (name and e-mail address) to me at this e-mail address: l-hedman@northwestern.edu.

Thank you in advance for your consideration of my request. Please feel free to contact me with any questions.

Best Regards,

Lois D. Hedman, PT, MS

Center Coordinators of Clinical Education of Pediatric Rehabilitation Hospitals

Dear Colleague,

My name is Lois D. Hedman, PT, MS. I am a physical therapist, an Associate Professor in the Department of Physical Therapy and Human Movement Sciences, Northwestern University Feinberg School of Medicine and doctoral student in the Department of Physical Therapy at the University of Alabama, Birmingham. I am contacting you to ask for your help in identifying colleagues to participate in the expert panel of the Delphi survey that I am conducting for my dissertation. The goal of the survey is to develop valid diagnostic classifications for bipedal locomotion that can be used as a basis for creating an assessment tool for classifying locomotor movement dysfunction.

The validity of the diagnostic classifications will be established by expert consensus achieved through the Delphi survey process. A Delphi Survey is a group facilitation process that endeavors to reach consensus amongst a group of knowledgeable individuals through a series of structured surveys. The process transforms individual opinions into group consensus by feeding back the group results to all individuals in each subsequent survey. The Delphi survey will be conducted entirely online via Survey Monkey. It is anticipated that 3 survey rounds will be necessary to achieve consensus and will take 4-5 months to complete.

I plan to include 100 expert participants for the survey. I am recruiting physical therapists and physicians who are either primarily clinicians or researchers, and other scientists who conduct locomotor research. I am interested in recruiting individuals who work with adults as well as children.

I am asking your help in identifying physical therapist colleagues from your department who you consider to be experts in locomotion. The only requirements are that the individuals are American Board of Physical Therapy Specialties certified Pediatric Clinical Specialists and have a minimum of 5 years of clinical experience. You may identify yourself as such an expert.

If you think of colleagues who meet those criteria please send their contact information (name and e-mail address) to me at this e-mail address: l-hedman@northwestern.edu.

Thank you in advance for your consideration of my request. Please feel free to contact me with any questions.

Best Regards,

Lois D. Hedman, PT, MS

Neurologic Residency Program Directors:

Dear Colleague,

My name is Lois D. Hedman, PT, MS. I am a physical therapist, an Associate Professor in the Department of Physical Therapy and Human Movement Sciences, Northwestern University Feinberg School of Medicine and doctoral student in the Department of Physical Therapy at the University of Alabama, Birmingham. I am contacting you to ask for your help in identifying colleagues to participate in the expert panel of the Delphi survey that I am conducting for my dissertation. The goal of the survey is to develop valid diagnostic classifications for bipedal locomotion that can be used as a basis for creating an assessment tool for classifying locomotor movement dysfunction.

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I plan to include 100 expert participants for the survey. I am recruiting physical therapists and physicians who are either primarily clinicians or researchers, and other scientists who conduct locomotor research. I am interested in recruiting individuals who work with adults as well as children.

I am asking your help in identifying physical therapist colleagues associated with your residency program who you consider to be experts in locomotion. The only requirements are that the individuals are American Board of Physical Therapy Specialties certified Neurologic Clinical Specialists and have a minimum of 5 years of clinical experience. You may identify yourself as such an expert.

If you think of colleagues who meet those criteria please send their contact information (name and e-mail address) to me at this e-mail address: l-hedman@northwestern.edu.

Thank you in advance for your consideration of my request. Please feel free to contact me with any questions.

Best Regards,

Lois D. Hedman, PT, MS

Geriatric Residency Program Directors

Dear Colleague,

My name is Lois D. Hedman, PT, MS. I am a physical therapist, an Associate Professor in the Department of Physical Therapy and Human Movement Sciences, Northwestern University Feinberg School of Medicine and doctoral student in the Department of Physical Therapy at the University of Alabama, Birmingham. I am contacting you to ask for your help in identifying colleagues to participate in the expert panel of the Delphi survey that I am conducting for my dissertation. The goal of the survey is to develop valid diagnostic classifications for bipedal locomotion that can be used as a basis for creating an assessment tool for classifying locomotor movement dysfunction.

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I plan to include 100 expert participants for the survey. I am recruiting physical therapists and physicians who are either primarily clinicians or researchers, and other scientists who conduct locomotor research. I am interested in recruiting individuals who work with adults as well as children.

I am asking your help in identifying physical therapist colleagues associated with your residency program who you consider to be experts in locomotion. The only requirements are that the individuals are American Board of Physical Therapy Specialties certified Geriatric Clinical Specialists and have a minimum of 5 years of clinical experience. You may identify yourself as such an expert.

If you think of colleagues who meet those criteria please send their contact information (name and e-mail address) to me at this e-mail address: l-hedman@northwestern.edu.

Thank you in advance for your consideration of my request. Please feel free to contact me with any questions.

Best Regards,

Lois D. Hedman, PT, MS

Pediatric Residency Program Directors

Dear Colleague,

My name is Lois D. Hedman, PT, MS. I am a physical therapist, an Associate Professor in the Department of Physical Therapy and Human Movement Sciences, Northwestern University Feinberg School of Medicine and doctoral student in the Department of Physical Therapy at the University of Alabama, Birmingham. I am contacting you to ask for your help in identifying colleagues to participate in the expert panel of the Delphi survey that I am conducting for my dissertation. The goal of the survey is to develop valid diagnostic classifications for bipedal locomotion that can be used as a basis for creating an assessment tool for classifying locomotor movement dysfunction.

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I am asking your help in identifying physical therapist colleagues associated with your residency program who you consider to be experts in locomotion. The only requirements are that the individuals are American Board of Physical Therapy Specialties certified Pediatric Clinical Specialists and have a minimum of 5 years of clinical experience. You may identify yourself as such an expert.

If you think of colleagues who meet those criteria please send their contact information (name and e-mail address) to me at this e-mail address: l-hedman@northwestern.edu.

Thank you in advance for your consideration of my request. Please feel free to contact me with any questions.

Best Regards,

Lois D. Hedman, PT, MS

APPENDIX C

PROFESSIONAL GAIT ORGANIZATIONS

Professional Gait Organizations

1) Gait and Clinical Movement Analysis Society[1]

2) International Society of Posture and Gait Research[2]

References

1. Gait and Clinical Movement Analysis Society. http://www.gcmas.org/. Accessed August 13, 2011.
2. International Society of Posture and Gait Research. http://www.ispgr.org/. Accessed August 13, 2011.

APPENDIX D

TOP 10 REHABILIATION AND PEDIATRIC HOSPITALS

Rehabilitation Hospitals:

1. Rehabilitation Institute of Chicago
2. Kessler Institute for Rehabilitation
3. University of Washington Medical Center
4. TIRR Memorial Hermann
5. Baylor Institute for Rehabilitation
6. Spaulding Rehabilitation Hospital
7. Mayo Clinic
8. Craig Hospital
9. Rusk Institute, NYU Langone Medical Center
10. Sheperd Center

Pediatric Hospitals:

1. Children's Hospital Boston
2. Children's Hospital of Philadelphia
3. Johns Hopkins Children's Center
4. Texas Children's Hospital
5. St. Louis Children's Hospital-Washington University
6. Primary Children's Medical Center Salt Lake City, UT
7. Children's Hospital Cleveland Clinic Cleveland, OH
8. Cincinnati Children's Hospital Medical Center Cincinnati, OH
9. Children's Memorial Hospital Chicago, IL

APPENDIX E

RESIDENCY PROGRAMS OF THE AMERICAN PHYSICAL THERAPY ASSOCIATION

Residency Programs of the American Physical Therapy Association

Geriatric Physical Therapy Residency Programs of the American Physical Therapy Association

1. AllStar Therapy Geriatric Residency Program
2. Fox Rehabilitation Physical Therapy Post-graduate Residency Training Program in Geriatrics
3. Freedom Home Health and Ohio State University Geriatric Physical Therapy Residency
4. NHC Geriatric Clinical Residency Program
5. St. Catherine's Rehabilitation Hospital and Villa Maria Nursing Center Postprofessional Residency in Geriatric Physical Therapy
6. The Jewish Home for the Elderly Clinical Residency in Geriatrics
7. University of Delaware Geriatric Residency Program

Neurology Physical Therapy Residency Programs of the American Physical Therapy Association

1. Brooks/UNF Neurologic Residency Program
2. Casa Colina Neurologic Physical Therapy Residency Program
3. Kaiser Permanente Neurologic Physical Therapy Residency
4. Marquette University Physical Therapy Neurological PT Residency Program Co-sponsored by Zablocki VA Medical Center
5. Moss Rehab Neurologic Physical Therapy Residency Program **(INACTIVE)**
6. The Ohio State University Medical Center Neurologic Physical Therapy Residency Program
7. TIRR Memorial Hermann Neurologic Physical Therapy Residency Program in Collaboration with Texas Woman's University and the University of Texas Medical Branch in Galveston
8. Unity Health System and Ithaca College Residency in Neurologic Physical Therapy
9. University of Mississippi Neurologic Physical Therapy Residency Program
10. University of Southern California/Rancho Los Amigos National Rehabilitation Center Residency in Neurologic Physical Therapy

11. University of Washington Neurologic Physical Therapy Residency

12. UPMC Centers for Rehab Services Neurologic Physical Therapy Residency Program

13. Utah Neurologic Physical Therapy Residency Program

Pediatric Physical Therapy Residency Programs of the American Physical Therapy Association

1. Children's Healthcare of Atlanta Pediatric Physical Therapy Residency

2. Duke University Health System Pediatric Physical Therapist Residency

3. Munroe-Meyer Institute for Genetics and Rehabilitation Pediatric Physical Therapy Residency Program

4. Oregon Health & Science University and the Child Development & Rehabilitation Center Pediatric Physical Therapy Residency Program

5. The Children's Hospital of Philadelphia Physical Therapy Pediatric Residency Program

6. The Nisonger Center and Nationwide Children's Hospital Pediatric Physical Therapy Residency Program

7. University of Central Arkansas Pediatric Physical Therapy Residency Program

8. University of Chicago Medical Center Pediatric Residency

APPENDIX F

INVITATION TO ROUND 1 OF DELPHI SURVEY

Dear Colleague

My name is Lois D. Hedman, PT, MS. I am a physical therapist, an Associate Professor in the Department of Physical Therapy and Human Movement Sciences, Northwestern University Feinberg School of Medicine and doctoral student in the Department of Physical Therapy at the University of Alabama, Birmingham. I am contacting you because one of your colleagues identified you as a locomotor expert.

I am inviting you to participate in the expert panel of the Delphi survey I am conducting for my dissertation. The goal of the survey is to develop valid diagnostic classifications for bipedal locomotion that can be used as a basis for creating an assessment tool for classifying locomotor movement dysfunction.

As you know, observational gait analysis is the most common clinical method used to analyze walking. It is my experience that the resulting kinematic analysis has a somewhat limited value in guiding intervention decisions particularly for patients with dysfunction in areas of the central nervous system that control locomotion. What I believe is needed is a clinical method to analyze walking that helps the clinician understand what is underlying locomotor movement dysfunction. An analysis of *locomotion*, defined as the movement of an organism from one place to another, rather than *gait*, defined as a manner of walking, is anticipated to yield such clinically relevant information.

The Delphi survey methodology is a group facilitation process that endeavors to reach consensus amongst a group of knowledgeable individuals through a series of structured surveys. The process transforms individual opinions into group consensus by feeding back the group results to all individuals in each subsequent survey. This allows participants to reconsider their previous responses in light of the group's average response.

I estimate that this Delphi survey will entail 3 rounds lasting 4-5 months overall. Each survey should take you no more than 30-45 minutes to complete. The surveys will be conducted entirely online using Survey Monkey.

Round 1 will consist of collecting demographic data and asking you to respond to a proposed list of diagnostic classifications. The group responses will be summarized and presented to you in the Round 2 survey. You will be explicitly directed to review the group response as you respond to the Round 2 survey. The procedure will be repeated for Round 3.

I am inviting a broad spectrum of physical therapists and physicians who are primarily clinicians or researchers as well as other researchers from a variety of disciplines who conduct locomotor related research and have been identified as locomotor experts by their colleagues. I am intentionally including professionals who work with adults and children. I may contact you to recommend colleagues who you believe are experts in locomotion and meet the inclusion criteria.

If you choose to be in this study, you have the right to be treated with respect, including respect for your decision whether or not you wish to continue or stop being in the study. You are free to choose to stop being in the study at any time.

It is my hope that you will be able to commit to completing all 3 rounds of the Delphi survey. You will see that the first question on the survey asks for you to make a non-binding commitment.

You will be given 3 weeks to respond to each survey round. I will send out reminder e-mails at one week and 2 days before the 3 week deadline and one week after the deadline for all rounds. If you do not respond after that, you will be considered to have dropped out from the survey and you will not be included in future rounds of the survey.

The link to the first round of the Delphi survey is within the body of this email. By clicking on the link you will access the survey. In lieu of providing written consent, your participation in the survey will serve as your consent. Your responses will remain confidential. This study has been approved by the Institutional Review Boards of Northwestern University and University of Alabama, Birmingham.

APPENDIX G

DIAGNOSITIC CLASSIFICATION OF BIPEDAL LOCOMOTION FIRST ROUND

Diagnostic Classification of Bipedal Locomotion - First Round

PART 1: STATEMENT OF COMMITTMENT

1. I commit to do my best to participate in all the rounds of this Delphi survey.

◯ yes

I understand that I may exit and enter the survey an unlimited amount of times within a three week period starting the date I received the survey link.

PART 2: PARTICIPANT DEMOGRAPHICS

2. What is your age?

3. What is your sex?

4. What is your profession?

5. How many years have you been in this profession?

6. Identify all academic credentials and the year each was obtained.

7. Identify all professional credentials and the year each was obtained.

8. Rank the following activities according to how you spend your time. (1 – primary role, 2 - secondary role, etc; N/A if not applicable) Please specify additional roles.

	1	2	3	N/A
Clinical	◯	◯	◯	◯
Research	◯	◯	◯	◯
Teaching	◯	◯	◯	◯

Other (please specify)

Page 1

Diagnostic Classification of Bipedal Locomotion - First Round

9. Estimate the percentage of your total work time that you treat or study locomotion for the following populations

Adults (over 18 years of age)	
Children	
N/A Explain	

PART 3: PARTICIPANT FEEDBACK ABOUT DIAGNOSTIC CLASSIFICATIONS FOR LOCOMOTOR DYSFUNCTION:

For the purposes of this study, diagnostic classification is defined as a fundamental requirement of bipedal locomotion towards which examination and treatment can be directed.

Consider the proposed diagnostic locomotor classifications as you answer questions 10-14:

Initiation	Planned transition from quiet standing to walking
Termination	Planned transition from walking to quiet standing
Rhythmical Limb Movement	Manifestation of core locomotor pattern
Anti-Gravity Support	Generation of torques in stance limb and trunk sufficient to withstand gravity
Active Propulsion	Generation of torques primarily in the ankle to accelerate body center of mass in forward direction
Foot Clearance	Trajectory of the swinging foot such that it clears the support surface
Proactive Dynamic Equilibrium	Production of balances responses that are implemented for the expected perturbations accompanying walking and any other concurrent movements made during walking
Reactive Dynamic Equilibrium	Detection of unexpected perturbations from stimulated sensory systems and subsequent correction/stabilization
Steering and Accommodation	Adaptation of gait to accommodate or avoid environmental or other contextual demands
Spatial Mapping	Perceptual representation of large scale areas
Dual Task Capacity	Appropriate allocation of attention among simultaneous tasks
Balance Confidence	Self-perceived walking capability
Purposefulness	Set goal; initiate and achieve goal as planned
Energy Cost	Cardiovascular and respiratory demands associated with locomotion
Long-Term Viability	Stress on musculoskeletal system during locomotion

10. Are there any classifications that you think should be added? If so, please describe and provide your rationale.

Page 2

Diagnostic Classification of Bipedal Locomotion - First Round

11. Are there any classifications that you think should be removed? If so, please identify and provide your rationale.

12. Are there any classifications that you think should be reworded? If so, please indicate how you suggest they be reworded.

13. Are there any classifications that you think should be merged? If so, please identify and provide your rationale.

14. Please provide any comments you have at this time about the diagnostic classifications for locomotion.

15. Please select one of the following to guide the need for reminder e-mails.

◯ I have completed the survey. I do not anticipate the need to return to the survey. (If you choose this option, you will not receive reminder e-mails, but you will still have the option to return to the survey if you choose within the 3 week window.)

◯ I have not completed the survey and anticipate needing to return to it. (if you choose this option, you will receive reminder e-mails at one week and 2 days before the 3 week deadline and one week after the deadline.)

Page 3

APPENDIX H

DIAGNOSTIC CLASSIFICATION OF BIPEDAL LOCOMOTION SECOND ROUND

Diagnostic Classification of Bipedal Locomotion - Second Round

Welcome to Round 2 of the survey. Below you will find a summary of the expert panel demographics and the responses to the questions from Round 1.

EXPERT PANEL:

A total of 286 invitations to participate in the expert panel were sent out. I received 122 responses with a total of 115 included in the analysis. The following is a summary of the demographics of the 115 expert panelists.

AGE (years) - mean (SD) (range): 44.69 (9.46) (28-72)

PROFESSIONS: (4 respondents identified dual professions)
7 Bio(medical)Engineers
6 Biomechanists
1 Engineer
1 Gait Researcher
2 Neuroscientists
1 Orthopedic Surgeon
1 Orthotist
2 Physicians

YEARS IN PROFESSION - mean + SD (range): 19.08 + 9.47 (1.5-45)

TERMINAL ACADEMIC CREDENTIAL:
44 Physical Therapy Degrees: 5 Bachelors; 17 Masters; 22 Doctors of Physical Therapy
7 Master degrees (5 physical therapists)
59 PhD or other doctoral degrees (42 physical therapists)
4 Medical degrees
1 Certificate in Orthotics

Works primarily as a clinician: 44/115 (38.26%)
Works primarily as a researcher: 59/115 (51.30%)
Works as clinician and researcher equally: 12/115 (10.43%)
Works primarily with adults (> 18 years): 85/115 (73.91%)
Works primarily with children: 24/115 (20.87%)
Works with adults and kids equally: 6/115 (5.22%)

The following provides a quantitative summary of responses to the open ended questions:

ADD CLASSIFICATIONS?:
#Respondents who skipped the question 16/115 (13.91%)
#Respondents who did not skip the question 99/115 (86.1%)
#Respondents who explicitly stated no recommendations or comments 29/99 (29.29%)

REMOVE CLASSIFICATIONS?:
#Respondents who skipped the question 38/115 (33.04%)
#Respondents who did not skip the question 79/115 (68.7%)
#Respondents who explicitly stated no recommendations or comments 47/79 (59.49%)

MERGE CLASSIFICATIONS?:
#Respondents who skipped the question 48/115 (41.74%)
#Respondents who did not skip the question 67/115 (58.26%)
#Respondents who explicitly stated no recommendations or comments 42/67 (62.69%)

Diagnostic Classification of Bipedal Locomotion - Second Round

REWORD CLASSIFICATIONS?:
#Respondents who skipped the question 18/115 (15.65%)
#Respondents who did not skip the question 97/115 (84.35%)
#Respondents who explicitly stated no recommendations or comments 22/97 (22.68%)

OTHER COMMENTS?:
#Respondents who skipped the question 46/115 (40%)
#Respondents who did not skip the question 69/115 (60%)
#Respondents who explicitly stated no recommendations or comments 5/69 (7.25%)

DATA ANALYSIS:

Constant comparative analysis was utilized to analyze the responses to the open-ended questions from the Round 1 survey. All responses were reviewed by the qualitative analysis team. This team consists of two colleagues and myself. Both colleagues are experts in qualitative analysis and one is also an expert in locomotion.

We coded the responses as "remove" or "reword" when comments were pertinent to a specific classification. We also coded responses not associated with a specific classification as "addition," "merge," or "global."

DATA SUMMARY:

Please review this summary before you begin responding to the questions in this round. What you will be asked to do is to rate the validity, mutual exclusivity, and clarity of both the original, modified and new classifications using a Likert scale.

"Global" comments were sub-coded as indicated below.

Global Comment Codes and # Respondents
- Positive: 19
- Purpose: 12
- Utility (length, complexity, terminology): 10
- Measurement/quantification issues: 6
- Need for Restructuring of the Framework: 5
- Overall Definitions – Classification, Diagnosis: 5
- Underlying Theoretical Framework: 2
- Need for in person discussion beyond Delphi survey: 2
- Need for examples to clarify: 1
- Negative: 1

Diagnostic Classification of Bipedal Locomotion - Second Round

Many global comments were written as questions. The following explanation is an attempt to clarify the need, purpose, and scope of the current study.

Over 20 years ago the American Physical Therapy Association leadership stated that physical therapists (PTs) should establish a diagnosis prior to making patient management decisions. "Diagnosis by PTs is defined as both the process and end result of evaluating examination data that the therapist organizes into defined clusters, syndromes or categories to help determine prognosis and intervention."(1) Since then there have been numerous calls for PTs to develop and apply classification systems to guide and standardize physical therapist practice, improve communication amongst colleagues and categorize patients so that treatment effectiveness can be studied more effectively.(2-7) A classification system for locomotor dysfunction that is valid and has gained widespread clinical acceptance has yet to be developed. This has been attributed to the fact that there is no clear underlying conceptual framework of locomotion.(8,9) Locomotion is defined as the movement of an organism from one place to another.(10) This is a broader construct than that of gait, defined as a manner of walking or moving on foot.(11) Analysis of locomotion takes several movement systems into account - neural, biomechanical, cognitive, perceptual, and energetics and also considers the individual's goals and their need to interact with the environment.

The purpose of this study is to arrive at a consensus about the fundamental requirements of locomotion. These requirements will form a diagnostic framework for bipedal locomotor dysfunction. In the future, this framework will be used as a basis for the development of a valid and clinically feasible tool to enable physical therapists and other clinicians and researchers to classify locomotor movement problems. This tool will likely encompass measures of gait performance, balance, and confidence under a variety of contexts and time frames. Thus, valid and reliable measurement will be critically important in the development of the tool, but is beyond the scope of the present study. Although the classifications are intended to be mutually exclusive, a given person's locomotor movement problems may fall into more than one classification because of the interactions between the requirements of locomotion.

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2. Scheets PK, Sahrmann SA, Norton B. Diagnosis for physical therapy for patients with neuromuscular conditions. Neurology Report. 1999;23:158-169.

3. Scheets PL, Sahrmann SA, Norton BJ. Use of movement system diagnoses in the management of patients with neuromuscular conditions: a multiple-patient case report. Phys Ther. 2007;87:654-669.

4. Jette AM. Diagnosis and classification by physical therapists: a special communication. Phys Ther. 1989;69:967-969.

5. Rose SJ. Description and classification--the cornerstones of pathokinesiological research. Phys Ther. 1986;66:379-381.

6. Rose SJ. Physical therapy diagnosis: role and function. Phys Ther. 1989;69:535-537.

7. Sahrmann SA. Diagnosis by the physical therapist: a prerequisite for treatment. Phys Ther. 1988;68:1703-1706.

8. Kuo AD, Donelan JM. Dynamic principles of gait and their clinical implications. Phys Ther. 2010;90:157-174.

9. Thompson P. Higher level gait disorders. Current Neurology and Neuroscience Reports. 2007;7:290-294.

10. The American Heritage® Science Dictionary. Dictionary.com website: http://dictionary.reference.com/browse/locomotion. Accessed July 12, 2011.

11. Merriam-Webster's Medical Dictionary Dictionary.com website: http://dictionary.reference.com/browse/gait. Accessed July 12, 2011.

Diagnostic Classification of Bipedal Locomotion - Second Round

ROUND 2:

Each original classification will be presented along with a summary of the expert panel's recommendations from Round 1 about modifications to the name and/or description of the classification. This will be followed by any themes that were derived from those recommendations and a proposed modification to the classification name and/or description. You will then be asked to rate the original as well as the modified classifications using a Likert Scale.

"Reword" recommendations were further coded/grouped as "new name," "new description," "clarification," "concepts to include," "terminology," "subdivide" or "measures to quantify." We attempted to retain as much of the language used by respondents as possible. Each comment represents a comment from one respondent unless there is a number following the comment that indicates the number of respondents who stated this.

Please review this information as well as the information about the overall purpose of the project prior to rating these original and modified classifications. It may be helpful to review all the classifications prior to rating any of the classifications. Your preference for the original or modified classification should be reflected in your ratings.

ORIGINAL CLASSIFICATION NAME: Initiation
ORIGINAL CLASSIFICATION DESCRIPTION: Planned transition from quiet standing to walking

RECOMMENDATIONS:
Remove: 0 respondents
Reword: 2 respondents

SPECIFIC COMMENTS:
Drop the word "planned" - 2

THEMES DERIVED FROM COMMENTS:
Drop the word "planned"

MODIFIED CLASSIFICATION NAME: Initiation (no change)
MODIFIED CLASSIFICATION DESCRIPTION: Transition from quiet standing to walking

1. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

Initiation is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

2. Initiation is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

3. The description of Initiation is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

4. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

Initiation is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

5. Initiation is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

6. The description of Initiation is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

ORIGINAL CLASSIFICATION NAME: Termination
ORIGINAL CLASSIFICATION DESCRIPTION: Planned transition from walking to quiet standing

RECOMMENDATIONS:
Remove: 0 respondents
Reword: 2 respondents

SPECIFIC COMMENTS:
Drop the word "planned" - 2

THEMES DERIVED FROM COMMENTS:
Drop the word "planned"

MODIFIED CLASSIFICATION NAME: Termination (no change)
MODIFIED CLASSIFICATION DESCRIPTION: Transition from walking to quiet standing

7. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

Termination is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

8. Termination is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

9. The description of Termination is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

10. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

Termination is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

11. Termination is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

12. The description of Termination is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 6

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Rhythmical Limb Movement
ORIGINAL CLASSIFICATION DESCRIPTION: Manifestation of core locomotor pattern

RECOMMENDATIONS:
Remove: 2 respondents
Reword: 19 respondents

SPECIFIC COMMENTS:
New Name:
- Coordinated limb movement 2
- kinematics in comfor table walking speed
- Stepping or rhythmic stepping 2
- Interlimb and trunk coordination

Clarification:
- Unclear 5
- symmetry? 4
- cadence?
- Counter rotation hips/shoulders?
- minimization of COM displacement?
- reciprocal stepping?
- maneuverability?
- Include upper extremities?
- Reciprocating arm and leg swing?

Concepts to Include:
- Reciprocal arm and leg swing 2
- quality of heel strike base of support, step length

New Description:
- Manifestation of primary locomotor pattern

Subdivide:
- Break into finer categories such as percent of gait cycle in double limb support

Measures to quantify: 1

THEMES DERIVED FROM COMMENTS:
- include stepping and/or coordination in name
- clarify description
- include symmetry
- include arm swing

MODIFIED CLASSIFICATION NAME: Coordination of Rhythmical Stepping and Arm Swing
MODIFIED CLASSIFICATION DESCRIPTION: Reciprocal and symmetrical upper and lower extremity motion during walking

13. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

RHYTHMICAL LIMB MOVEMENT is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

14. RHYTHMICAL LIMB MOVEMENT is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

15. The description of RHYTHMICAL LIMB MOVEMENT is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

16. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

COORDINATION OF RHYTHMICAL STEPPING AND ARM SWING is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

17. COORDINATION OF RHYTHMICAL STEPPING AND ARM SWING is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

18. The description of COORDINATION OF RHYTHMICAL STEPPING AND ARM SWING is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 8

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Anti-gravity Support
ORIGINAL CLASSIFICATION DESCRIPTION: Generation of torques in stance limb and trunk sufficient to withstand gravity

RECOMMENDATIONS:
Remove: 1 respondent
Reword: 13 respondents

SPECIFIC COMMENTS:
New Names:
- Stability in stance 3
- Stability 3
- Extension pattern
- Active anti-gravity support

Clarification:
- Unclear
- Does it need to be active or would passive stability count? (hanging on ligaments)
- double limb support?
- Force generation to ascend or descend stairs, unlevel terrain?

Concepts to Include:
- upper extremity stability for use of assistive devices
- ability to be upright
- ability to balance in stance

THEMES DERIVED FROM COMMENTS:
- include stability and stance in name
- no themes emerged from analysis for description

MODIFIED CLASSIFICATION NAME: Stance Stability
MODIFIED CLASSIFICATION DESCRIPTION: Generation of torques in trunk and limbs sufficient for stance stability

19. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

ANTI-GRAVITY SUPPORT is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

20. ANTI-GRAVITY SUPPORT is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

21. The description of ANTI-GRAVITY SUPPORT is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

22. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

STANCE STABILITY is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

23. STANCE STABILITY is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

24. The description of STANCE STABILITY is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

ORIGINAL CLASSIFICATION NAME: Active Propulsion
ORIGINAL CLASSIFICATION DESCRIPTION: Generation of torques primarily in the ankle to accelerate body center of mass in forward direction

RECOMMENDATIONS:
Remove: 2 respondents
Reword: 15 respondents

SPECIFIC COMMENTS:
New Name:
- Forward progression (during stance) 5
- Swing limb advancement 1
- Propulsion 1

Clarification:
- poor description
- Force generation to ascend or descend stairs, unlevel terrain?

Terminology:
- Calf controls forward momentum, but not active propulsion

Concepts to Include:
- entire lower extremity 7
- other directions besides forward 2

THEMES DERIVED FROM COMMENTS:
- include progression/advancement in name
- need to broaden description beyond ankle

MODIFIED CLASSIFICATION NAME: Progression During Stance
MODIFIED CLASSIFICATION DESCRIPTION: Generation of torques to accelerate body center of mass in direction of locomotion

Diagnostic Classification of Bipedal Locomotion - Second Round

25. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

ACTIVE PROPULSION is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

26. ACTIVE PROPULSION is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

27. The description of ACTIVE PROPULSION is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

28. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

PROGRESSION DURING STANCE is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

29. PROGRESSION DURING STANCE is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

30. The description of PROGRESSION DURING STANCE is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 11

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Foot Clearance
ORIGINAL CLASSIFICATION DESCRIPTION: Trajectory of the swinging foot such that it clears the support surface

RECOMMENDATIONS:
Remove: 0 respondents
Reword: 11 respondents

SPECIFIC COMMENTS:
New Name:
- Swing limb advancement/progression 5
- Intralimb coordination
- Flexion pattern

Clarification:
- Trajectory not as important as just clearing? 2

Concepts to Include:
- Entire lower extremity 4

New Description:
- Distance between the foot of the swing leg and the ground

THEMES DERIVED FROM COMMENTS:
- name - too narrow
- consider all of lower extremity - not just foot
- trajectory not important as ability of limb to to clear

MODIFIED CLASSIFICATION NAME: Swing Limb Advancement
MODIFIED CLASSIFICATION DESCRIPTION: Ability to lift the swing limb clear of the support surface to progress it in the direction of locomotion

31. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

FOOT CLEARANCE is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

32. FOOT CLEARANCE is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

33. The description of FOOT CLEARANCE is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

34. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

SWING LIMB ADVANCEMENT is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

35. SWING LIMB ADVANCEMENT is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

36. The description of SWING LIMB ADVANCEMENT is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 13

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Proactive Dynamic Equilibrium
ORIGINAL CLASSIFICATION DESCRIPTION: Production of balance responses that are implemented for the expected perturbations accompanying walking and other concurrent movements made during walking

RECOMMENDATIONS:
Remove: 1 respondent
Reword: 16 respondents

SPECIFIC COMMENTS:
Terminology:
- anticipatory instead of proactive 3
- Balance instead of dynamic equilibrium 2
- Predictive

Clarification:
- hard to distinguish from steering and accommodation 2
- hard to distinguish from reactive dynamic equilibrium
- lateral weight shifting?
- turning?
- different surfaces?
- stabilization during walking?
- double limb support?

Terminology:
- Don't use "response" seems reactive
- Use "anticipated" vs "expected"

New Description:
- Production of forces among body segments that occur due to feedforward or anticipatory conditions

Subdivide:
- Tease out sensory and motor components

THEMES DERIVED FROM COMMENTS:
- Terminology important – eg. anticipatory and balance
- Differentiate from steering and accommodation and reactive dynamic equilibrium classifications

MODIFIED CLASSIFICATION NAME: Anticipatory Dynamic Balance
MODIFIED CLASSIFICATION DESCRIPTION: Postural adjustments in preparation for expected perturbations accompanying walking in order to achieve dynamic equilibrium

37. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

PROACTIVE DYNAMIC EQUILIBRIUM is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

38. PROACTIVE DYNAMIC EQUILIBRIUM is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

39. The description of PROACTIVE DYNAMIC EQUILIBRIUM is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

40. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

ANTICIPATORY DYNAMIC BALANCE is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

41. ANTICIPATORY DYNAMIC BALANCE is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

42. The description of ANTICIPATORY DYNAMIC BALANCE is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Reactive Dynamic Equilibrium

ORIGINAL CLASSIFICATION DESCRIPTION: Detection of unexpected perturbations from stimulated sensory systems and subsequent correction/stabilization

RECOMMENDATIONS:
Remove: 1 respondent
Reword: 10 respondents

SPECIFIC COMMENTS FOR NAME:
Terminology:
• Balance instead of dynamic equilibrium 2

New Names:
• Response control
• Reactionary balance

SPECIFIC COMMENTS FOR DESCRIPTION:
Clarification:
• Ambiguous
• different surfaces?
• Movements other than walking?

Concepts to Include:
• stabilization during walking

New Descriptions:
• Production of forces among body segments that occur due to feedback conditions
• Response to unexpected perturbations with subsequent correction/stabilization

Subdivide:
• Tease out sensory and motor components

THEMES DERIVED FROM COMMENTS:
• name - "balance" instead of "equilibrium"
• description - no themes emerged from analysis

MODIFIED CLASSIFICATION NAME: Reactive Dynamic Balance

MODIFIED CLASSIFICATION DESCRIPTION: Detection of and response to unexpected perturbations that occur during walking in order to achieve dynamic equilibrium

43. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

REACTIVE DYNAMIC EQUILIBRIUM is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

44. REACTIVE DYNAMIC EQUILIBRIUM is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

45. The description of REACTIVE DYNAMIC EQUILIBRIUM is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

46. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

REACTIVE DYNAMIC BALANCE is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

47. REACTIVE DYNAMIC BALANCE is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

48. The description of REACTIVE DYNAMIC BALANCE is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 17

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Steering and Accomodation
ORIGINAL CLASSIFICATION DESCRIPTION: Adaptation of gait to accommodate or avoid environmental or other contextual demands

RECOMMENDATIONS:
Remove: 0 respondents
Reword: 25 respondents

SPECIFIC COMMENTS FOR NAME:
Terminology:
- Steering implies driving car

New Name:
- Adaptability 6
- Navigation
- Context independence or adaptability
- Variability

Subdivide:
- Divide into steering and variability

SPECIFIC COMMENTS FOR DESCRIPTION:
Clarification:
- Different environments and support surfaces? 2
- Hard to distinguish from proactive dynamic equilibrium 2
- includes backward walking?
- includes use of assistive device?
- orientation to environment?
- awareness of environment?
- Force generation to ascend or descend stairs, unlevel terrain?
- Hard to distinguish from reactive dynamic equilibrium

Concepts to Include:
- Different environments and support surfaces 3
- change in speed 3
- changing direction 4
- variable footwear 2
- obstacles 2
- Description is only for steering
- Elaborate on contextual and environmental demands
- trunk

New Descriptions:
- ability to be flexible with gait in different contexts
- depending on task demands or individual's goal
- accommodation refers to the ability of the locomotor system to adapt to changing environmental conditions

Subdivide:
- Split into with and without elevation

THEMES DERIVED FROM COMMENTS:
- prefer "adaptability" for name
- specify about what environment and context means for description

MODIFIED CLASSIFICATION NAME: Adaptability

Diagnostic Classification of Bipedal Locomotion - Second Round

MODIFIED CLASSIFICATION DESCRIPTION: Ability to adjust gait to accommodate changes in physical environment (eg. unlevel terrain, obstacles, slippery conditions) or other contextual demands (eg. crowds, being in a hurry) that require a change in direction, path or speed

49. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

STEERING AND ACCOMODATION is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

50. STEERING AND ACCOMODATION is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

51. The description of STEERING AND ACCOMODATION is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

52. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

ADAPTABILITY is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

53. ADAPTABILITY is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

54. The description of ADAPTABILITY is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 19

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Spatial Mapping

ORIGINAL CLASSIFICATION DESCRIPTION: Perceptual representation of large scale areas

RECOMMENDATIONS:
Remove: 2 respondents
Reword: 17 respondents

SPECIFIC COMMENTS FOR NAME:
New Name:
• Spatial processing and mapping

SPECIFIC COMMENTS FOR DESCRIPTION:
Clarification:
• Needs better description 4
• Size of area – only large? 4
• Define large scale
• Perception of self?
• Other senses besides vision?
• Pathfinding?
• Does this reference the patient or the examiner?

Concepts to Include:
• Vision, visual field, orientation, perception, concentration 4
• Smaller areas too
• awareness of environment (avoid obstacles)
• Unseen destinations

New Description:
• Orienting to walk to a goal based on the layout of the area the person has to walk through to get there
• Perceptual Representation of large scale areas for what…?

Measure to Quantify: 5

THEMES DERIVED FROM COMMENTS:
• no themes derived from analysis for name
• define more clearly

MODIFIED CLASSIFICATION NAME: Navigation to Unseen Locations

MODIFIED CLASSIFICATION DESCRIPTION: Visual perceptual representation of large scale areas to allow pathfinding to known, but unseen locations

55. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

SPATIAL MAPPING is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Page 20

Diagnostic Classification of Bipedal Locomotion - Second Round

56. SPATIAL MAPPING is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

57. The description of SPATIAL MAPPING is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

58. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

NAVIGATION TO UNSEEN LOCATIONS is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

59. NAVIGATION TO UNSEEN LOCATIONS is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

60. The description of NAVIGATION TO UNSEEN LOCATIONS is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 21

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Dual Task Capacity
ORIGINAL CLASSIFICATION DESCRIPTION: Appropriate allocation of attention among simultaneous tasks

RECOMMENDATIONS:
Remove – 0 respondents
Reword – 9 respondents

SPECIFIC COMMENTS FOR NAME:
Terminology:
• Dual is limiting 1

New Name:
• Multi Task Capacity - 4

SPECIFIC COMMENTS FOR DESCRIPTION:
Concepts to Include:
• Implies only cognitive/attentional tasks; needs to include motor tasks
• Ability to use UEs during walking

New Descriptions:
• Appropriate capacity and allocation of attention among simultaneous tasks
• Appropriate allocation of physical and cognitive resources amongst simultaneous tasks

THEMES DERIVED FROM COMMENTS:
• Replace "dual-task" with "Multi-task"
• Broaden types and number of secondary tasks

MODIFIED CLASSIFICATION NAME: Multi Task Capacity

MODIFIED CLASSIFICATION DESCRIPTION: Appropriate allocation of attention among psychomotor and/or cognitive tasks that are carried out while walking

61. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

DUAL TASK CAPACITY is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

62. DUAL TASK CAPACITY is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

63. The description of DUAL TASK CAPACITY is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

64. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

MULTI TASK CAPACITY is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

65. MULTI TASK CAPACITY is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

66. The description of MULTI TASK CAPACITY is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 23

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Balance Confidence
ORIGINAL CLASSIFICATION DESCRIPTION: Self-perceived walking capability

RECOMMENDATIONS:
Remove – 3 respondents
Reword – 21 respondents

SPECIFIC COMMENTS FOR NAME:
New Names:
- Walking confidence 11
- Confidence
- Self-efficacy

SPECIFIC COMMENTS FOR DESCRIPTION:
Clarification Needed:
- Balance confidence not same as walking confidence (speed, distance, strength) 6
- same/different as walking confidence or self-efficacy?
- Vague

Concepts to Include:
- standing
- Observed balance

New Descriptions:
- Self-perceived walking ability 2
- Self efficacy (to carry out task as intended) 2
- Self-perceived balance capacity
- Self perceived balance and ability to avoid falls

Measure to Quantify – self report measure

THEMES DERIVED FROM COMMENTS:
- Balance needs to be replaced with walking; then description will match name

MODIFIED CLASSIFICATION NAME: Walking Confidence
MODIFIED CLASSIFICATION DESCRIPTION: Self-perceived walking capability (no change)

67. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

BALANCE CONFIDENCE is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

68. BALANCE CONFIDENCE is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

69. The description of BALANCE CONFIDENCE is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

70. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

WALKING CONFIDENCE is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

71. WALKING CONFIDENCE is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

72. The description of WALKING CONFIDENCE is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 25

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Purposefulness
ORIGINAL CLASSIFICATION DESCRIPTION: Set goal; initiate and achieve goal as planned

RECOMMENDATIONS:
Remove – 9 respondents
Reword - 11 respondents

SPECIFIC COMMENTS FOR NAME:
New Name:
• Goal direction
• Behavioral constraints to output

SPECIFIC COMMENTS FOR DESCRIPTION:
Clarification:
• How you orient yourself to environment?
• Cognitive?

Concepts to Include:
• Motivation
• Problem-solving

New Description:
• Ability to attempt activity as planned versus necessarily achieving the goal

Measure to Quantify: 3

THEMES DERIVED FROM COMMENTS:
• no themes derived from analysis for name
• description unclear

MODIFIED CLASSIFICATION NAME: Purposefulness (no change)
MODIFIED CLASSIFICATION DESCRIPTION: Ability to utilize locomotion as part of a plan to achieve a set goal.

73. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

PURPOSEFULNESS is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

74. PURPOSEFULNESS is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

75. The description of PURPOSEFULNESS is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

76. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

PURPOSEFULNESS is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

77. PURPOSEFULNESS is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

78. The description of PURPOSEFULNESS is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 27

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Energy Cost

ORIGINAL CLASSIFICATION DESCRIPTION: Cardiovascular and respiratory demands associated with locomotion

RECOMMENDATIONS:
Remove: 1 respondent
Reword: 11 respondents

SPECIFIC COMMENTS FOR NAME:
New Names:
- Metabolic energy cost 1
- Energy expenditure 1

SPECIFIC COMMENTS FOR DESCRIPTION:
Clarification:
- Raw data or per unit distance?

Concepts to Include:
- Motor/neuromuscular endurance/strength/timing 4
- Energy wasting movement – dystonia or increased tone
- Perceived exertion
- Efficiency

New Descriptions:
- Must be able to meet the cardiovascular and respiratory…
- Metabolic demand associated with standing or walking

THEMES DERIVED FROM COMMENTS:
- Terminology issues – need a term that includes muscle in name
- Want muscle encompassed in description

MODIFIED CLASSIFICATION NAME: Metabolic Energy Expenditure

MODIFIED CLASSIFICATION DESCRIPTION: Energy demand and resources sufficiently matched to achieve locomotor goals

79. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

ENERGY COST is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

80. ENERGY COST is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

81. The description of ENERGY COST is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

82. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

METABOLIC ENERGY EXPENDITURE is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

83. METABOLIC ENERGY EXPENDITURE is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

84. The description of METABOLIC ENERGY EXPENDITURE is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 29

Diagnostic Classification of Bipedal Locomotion - Second Round

ORIGINAL CLASSIFICATION NAME: Long-Term Viability
ORIGINAL CLASSIFICATION DESCRIPTION: Stress on musculoskeletal system during locomotion

RECOMMENDATIONS:
Remove: 5 respondents
Reword: 23 respondents

SPECIFIC COMMENTS FOR NAME:
Terminology:
• The term, LTV, does not represent the definition 2

New Names:
• Biomechanical cost and efficiency 1
• Musculoskeletal stress/sequela 2

SPECIFIC COMMENTS FOR DESCRIPTION:
Clarification:
• Unclear/vague 5
• maintenance of mobility from childhood, adolescence and adulthood?
• why only musculoskeletal?
• Upper extremities?

Terminology:
• Change stress to demands
• Make more specific to musculoskeletal

Concepts to include:
• shock absorption during loading 2
• Cardiovascular stress 2
• biomechanical soundness – key
• risk of falls

Revised Descriptions:
• ability of musculoskeletal system to sustain the stresses of locomotion over time
• Risk of injury due to abnormal stresses
• musculoskeletal integrity

Need for a measure to quantify: 5

THEMES DERIVED FROM COMMENTS:
• Do not like the term viability
• Restate – too vague

MODIFIED CLASSIFICATION NAME: Long-term Musculoskeletal Integrity
MODIFIED CLASSIFICATION DESCRIPTION: Ability of musculoskeletal system to withstand the demands of locomotion over the lifespan

Diagnostic Classification of Bipedal Locomotion - Second Round

85. FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

LONG-TERM VIABILITY is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

86. LONG-TERM VIABILITY is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

87. The description of LONG-TERM VIABILITY is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

88. FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

LONG-TERM MUSCULOSKELETAL INTEGRITY is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

89. LONG-TERM MUSCULOSKELETAL INTEGRITY is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

90. The description of LONG-TERM MUSCULOSKELETAL INTEGRITY is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Comments about the original or modified classification?

Page 31

Diagnostic Classification of Bipedal Locomotion - Second Round

NEW CLASSIFICATIONS:

The following is a summary of the classifications that were recommended to be added by the expert panel. Recommendations were grouped by the qualitative analysis team. The number of respondents who made each recommendation is presented in the right hand column. You may note that some of these issues were brought up under some of the specific classifications as well. Those were coded as "reword." Comments that made no reference to a specific classification were coded as "Additions." Please review this information as well as the information about the overall purpose of the project prior to rating these additional classifications.

Suggested Additions:

Temporal and spatial characteristics of walking: 22 total
- step length - 7
- speed - 13
- cadence - 2
- Step width - 1

Kinematics of Walking; Symmetry; Quality of gait: 22
Gait Phases: 11
Stability – standing /stance: 6
Endurance (distance or time measure): 5
Kinetics: 4 total
- Braking impulses - 2
- joint moments - 1
- maintaining momentum - 1

Impairments: sensory deficits, visual acuity, motor control, contractures, pain, ROM, altered weight bearing status, biomechanical concerns, perception of self: 4
Need for external support/devices: 3
Muscle activation timing/motor control: 3
Arm swing: 3
Pelvic or postural engagement/Core stabilization: 2
Interlimb coordination - Weight transfer between legs: 2
Variability/consistency: 1
Cautious gait (Nutt): 1
Personal and cultural values: 1
fall risk/# stumbles: 1
Sit to stand: 1
Amount of body affected: 1
Confidence in Catching themselves: 1
Locomotor Planning: 1
Apraxia: 1
Adaptive - Trunk: 1

Diagnostic Classification of Bipedal Locomotion - Second Round

The qualitative analysis team decided that the following concepts demonstrated sufficient support from panel respondents in Round 1 to be presented for rating in Round 2 as potential additional locomotor requirements.

Please rate each of the following 6 proposed requirements of locomotion. Consider whether you believe they should be added to the other requirements of locomotion as you rater their validity, mutual exclusivity and clarity. Keep all the existing requirements in mind as well as the paragraphs explaining the purpose and scope of the study prior to rating them.

CLASSIFICATION NAME: Joint and Segmental Kinematics of Gait
CLASSIFICATION DESCRIPTION: Position, displacement, velocity and acceleration of the body segments during walking often organized by the phases of gait.

CLASSIFICATION NAME: Temporal and Spatial Descriptors of Gait
CLASSIFICATION DESCRIPTION: Temporal and spatial measures of gait cycle and/or observations about quality of gait pattern.

CLASSIFICATION NAME: Standing Stability
CLASSIFICATION DESCRIPTION: Capacity to attain upright posture and maintain standing balance

CLASSIFICATION NAME: Kinetics of Gait
CLASSIFICATION DESCRIPTION: Forces applied across joints, moments generated by muscles and mechanical power and energy generated during walking.

CLASSIFICATION NAME: Endurance
CLASSIFICATION DESCRIPTION: Distance or temporal measures of maximal continuous walking

CLASSIFICATION NAME: Body Structures and Function
CLASSIFICATION DESCRIPTION: Alterations at the body structure and function level related to walking

91. FOR THE NEXT 3 QUESTIONS, please rate this proposed ADDITIONAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

JOINT AND SEGMENTAL KINEMATICS OF GAIT is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

92. JOINT AND SEGMENTAL KINEMATICS OF GAIT is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

93. The description of JOINT AND SEGMENTAL KINEMATICS OF GAIT is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

94. FOR THE NEXT 3 QUESTIONS, please rate this proposed ADDITIONAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

TEMPORAL AND SPATIAL DESCRIPTORS OF GAIT is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

95. TEMPORAL AND SPATIAL DESCRIPTORS OF GAIT is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

96. The description of TEMPORAL AND SPATIAL DESCRIPTORS OF GAIT is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

97. FOR THE NEXT 3 QUESTIONS, please rate this proposed ADDITIONAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

STANDING STABILITY is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

98. STANDING STABILITY is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

99. The description of STANDING STABILITY is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

100. FOR THE NEXT 3 QUESTIONS, please rate this proposed ADDITIONAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

KINETICS OF GAIT is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

101. KINETICS OF GAIT is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

102. The description of KINETICS OF GAIT is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

103. FOR THE NEXT 3 QUESTIONS, please rate this proposed ADDITIONAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

ENDURANCE is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

104. ENDURANCE is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

105. The description of ENDURANCE is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

106. FOR THE NEXT 3 QUESTIONS, please rate this proposed ADDITIONAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree or strongly disagree with the statement.

BODY STRUCTURES AND FUNCTION is a valid diagnostic classification for locomotion.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

107. BODY STRUCTURES AND FUNCTION is mutually exclusive of the other classifications.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

108. The description of BODY STRUCTURES AND FUNCTION is understandable.

Strongly Agree	Agree	Disagree	Strongly Disagree
○	○	○	○

Diagnostic Classification of Bipedal Locomotion - Second Round

The following summarizes the classifications that were recommended to be MERGED in Round 1. The left hand column lists the recommendations and the number of respondents who made each recommendation is presented in the right hand column.

Suggested Merge: # Respondents
- Proactive dynamic equilibrium + steering and accomodation: 3
- Reactive + proactive equilibrium: 3
- Spatial mapping + purposefulness: 3
- Energy cost + long term viability: 2
- Initiation + Termination (transition): 2
- Steering and Accomodation + proactive equilibrium + reactive: 1
- Energy cost + biomechanical soundness ⇒ efficiency: 1
- Energy cost + viability + safety ⇒ sustainability: 1
- Steering & accommodation + purposefulness ⇒ planning: 1
- Spatial mapping + steering & accomodation: 1
- Initiation + Termination + Purposefulness: 1
- Dual task + purposefulness + mapping: 1

The qualitative analysis team did not believe that any of the merge recommendations demonstrated sufficient support from the entire panel to be put forth for rating in Round 2. However, there were 5 global comments coded as "restructure," that recommended grouping the classifications into fewer categories. Based on this the team felt that the following restructuring should be commented upon in Round 2.

Transitions
- Initiation
- Termination

Stance
- Stance Stability
- Progression During Stance

Interlimb and Intralimb Coordination
- Coordination of Rhythmical Stepping and Arm Swing
- Swing Limb Advancement

Balance
- Anticipatory Dynamic Balance
- Reactive Dynamic Balance

Task and Environmental Context
- Adaptability
- Navigation to Unseen Locations
- Multi Task Capability
- Walking Confidence
- Purposefulness

Sustainability
- Metabolic Energy Expenditure
- Long-Term Musculoskeletal Integrity

109. Please comment on this alternative organization of the classifications.

Diagnostic Classification of Bipedal Locomotion - Second Round

110. Please provide any comments you have at this time about the diagnostic classifications for locomotion.

111. Please select one of the following to guide the need for reminder e-mails.

◯ I have completed the survey. I do not anticipate the need to return to the survey. (If you choose this option, you will not receive reminder e-mails, but you will still have the option to return to the survey if you choose within the 3 week window.)

◯ I have not completed the survey and anticipate needing to return to it. (if you choose this option, you will receive reminder e-mails at one week and 2 days before the 3 week deadline and one week after the deadline.)

APPENDIX I

DIAGNOSTIC CLASSIFICATIONOF BIPEDAL LOCOMOTION
THIRD ROUND

Diagnostic Classification of Bipedal Locomotion Third Round

Welcome to Round 3 of the Delphi Survey of Diagnostic Classifications for Bipedal Locomotion!

SUMMARY OF ROUND 2 EXPERT PANEL DEMOGRAPHICS:

I sent out 123 Round 2 surveys. I received 78 responses, all of which are included in the analysis. The following is a summary of the demographics of the 78 expert panelists who participated in Round 2.

AGE (years) - mean (SD) (range): 43.62 (9.51) (28-72)

PROFESSIONS: (2 respondents identified dual professions)
5 Bio(medical)Engineers
4 Biomechanists
1 Gait Researcher
1 Orthopedic Surgeon
65 Physical Therapists
1 Physician
2 Professors
1 Scientist

YEARS IN PROFESSION - mean + SD (range): 17.91 + 9.5 (1.5-40)

TERMINAL ACADEMIC CREDENTIAL:
25 Physical Therapy Degrees: 1 Bachelors; 10 Masters; 14 Doctors of Physical Therapy
4 Master degrees (4 physical therapists)
47 PhD or other doctoral degrees (36 physical therapists)
2 Medical degrees

Works primarily as a clinician: 26/78 (33.33%)
Works primarily as a researcher: 40/78 (51.28%)
Works as clinician and researcher equally: 12/78 (15.38%)
Works primarily with adults (> 18 years): 58/78 (74.36%)
Works primarily with children: 17/78 (21.79%)
Works with adults and kids equally: 3/78 (3.85%)

Diagnostic Classification of Bipedal Locomotion Third Round

DATA ANALYSIS:

Constant comparative analysis was utilized to analyze the responses to the open-ended questions from the Round 2 survey. All responses were reviewed by the qualitative analysis team. This team consists of two colleagues and myself. Both colleagues are experts in qualitative analysis and one is also an expert in locomotion.

We coded the responses as "clarify," "clinical utility," "construct," "difficulty with survey," "general comment," "overlap," "preference," "purpose," "specific recommendation," or "terminology."

We attempted to retain as much of the language used by respondents as possible. Each comment represents a comment from one respondent unless there is a number following the comment that indicates the number of respondents who stated this.

ROUND 2 OVERALL COMMENTS:

Open-ended comments about the classifications are presented below. Please review this summary before you proceed.

PURPOSE:

• I still don't understand why you are doing this. There is a clear rubric for gait that is well established, used, agreed upon by people who have been studying it for decades. All of the terms presented here vague and therefore confusing. Rather than making up your own jargon, would it be possible to adopt terminology that is: a) representative of quantifiable/identifiable events and b)agreed upon by people who have studied and understand gait? Also, why the need to differentiate gait and locomotion? What is your distinction?

• locomotion is not just gait so it concerns me that we are classifying locomotion vs gait. Rancho does a good classification of gait. Diagnostic classifications depend on pathology. No pathology has been
mentioned to put the description into context

• assume these classifications pertain to a global definition of locomotion...since the classifications go beyond the physical requirements to also encompass many elements that are required for functional walking.

• there are very few true diagnostic indicators of gait

• Seems that there is an overall confusion with the classification titles and descriptions...there is a mixture of assessing outcomes and etiologies. Seems like in gait we should be documenting exactly what we see or can measure. The hypotheses about the etiologies should be our evaluation. For example under Navigation to Unseen Locations...how do we know they have adequate "visual perceptual representation"? All we really can assess is that their ability to navigate to unseen locations is impaired. It will be more clear if we can separate the "outcome" from suppostions about the etiology. I really think the ability to catch one self on the floor is a measure of safety that is important to gait.

• these classifications seem to be missing essential "personal" elements of locomotion such as cultural issues, planning and problem solving, assistive devices, clothing, orthotics, prosthetics, etc

OVERLAP

• much overlap in the categories since many things are happening at the same time during gait.

• many are interdependent, and that people may confuse the terms or have difficulty in discriminating between the terms

• very few variables of gait are mutually exclusive. For instance kinetics cannot be truly exclusive of kinematics.

Diagnostic Classification of Bipedal Locomotion Third Round

CLINICAL UTILITY:

• how will the typical clinician be able to describe the Kinetic forces without a lab or specialized equipment?
• Changing and narrowing the scope of these diagnostic classifications is necessary to accomodate updates in scientific literature and to sensitively diagnose gait dysfunction across heterogeneous populations.
• recommend trying to keep it as simple as possible. Although gait is very complex, if the system is too burdensome clinicians will not use it.
• Great work, I really like the classifications and can see them as useful in clinical practice!
• It's an important work being done. I believe that we as physiotherapists should be experts in observing and assessing locomotion and then it is most important to find a common language with which to communicate
• It's going to be tough to quantify some of these variables. I still would like to eliminate the language that is dependent upon vision like "unseen". Locomotion is an internally driven mechanism that is guided by environmental cues and, in the case of familiarity, internal maps and recall of previous experience. Many of the suggested categories are multi-faceted constructs and will make this tool difficult to refine. Perhaps this project helps us to determine which domain is problematic for people who display functional limitations in order for us to target our interventions.
• helpful to the average clinician to give examples of Kinematic vs. Kinetic vs. Body Structure/Function issues

SPECIFIC RECOMMENDATION:

• very established gait literature and agreement for cerebral palsy with good agreement, i suppose it's hard to translate every gait measure to all conditions, but please see the Inernational society of prosthetic and orthotics systematic review of gait anaylsis and classification
• Where does gait speed fit in? Since gait speed is linked to our ability to use locomotion in a functional context (and the likelihood that we will use locomotion at a household or community level), it should have a distinct place in this classification. Is there an existing category that includes gait speed?
• All classifications should include the term "impairment" following the term used for the classification.

DIFFICULTY WITH SURVEY:

• challenging to make comparisons of the new diagnostic classification options with the previously presented survey information--lots of scrolling required, and lots of information to try to integrate. It would have been helpful to have a summary of the initial classification to compare with the new options.
• It was a little hard to follow, with so much to review on

ROUND 3:

Each original and modified classification will now be presented along with a summary of the expert panel's open-ended and Likert scale responses about the classification from Round 2. You will then be asked to rate the validity, mutual exclusivity, and clarity of both the original and modified versions of the classifications using a Likert scale. You will have an additional opportunity to provide open-ended comments. It may be helpful to review all the classifications prior to rating any of the classifications. Your preference for the original or modified classification should be reflected in your ratings.

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL DIAGNOSTIC CLASSIFICATION NAME: Initiation
ORIGINAL DIAGNOSTIC CLASSIFICATION DESCRIPTION: Planned transition from quiet standing to walking

MODIFIED DIAGNOSTIC CLASSIFICATION NAME: Initiation (no change)
MODIFIED DIAGNOSTIC CLASSIFICATION DESCRIPTION: Transition from quiet standing to walking

OPEN-ENDED RESPONSES: n = 22

PREFERENCE:
• Agree with/prefer Modified - 9
(1 of 9) Can't tell if initiation is planned or not
(1 of 9) Planning is a cognitive process; overlaps with purposefulness
• Prefer Original - to distinguish from controlled fall
• No preference - planning suggests cognitive process; most of the time initiation occurs automatically
CLARIFY:
• Does this classification apply to transitions from sitting?
• Planned means voluntary?
• They seem the same
• Modified version too wordy
SPECIFIC RECOMMENDATION:
• Name: "Gait Initiation"
• Name: "Initiation Impairment"
• Description: Transition from a quiet posture (or position) to walking"
GENERAL COMMENT:
• Without "planned" initiation may include a response to an external perturbation. Planned indicates purposeful transition
• Classification does not include wheelchair locomotion
• Associated pathologies - akinesia, bradykinesia, or apraxia 2
DIFFICULTY WITH SURVEY
• error in survey questions

LIKERT SCALE RESPONSES - VALIDITY:

ORIGINAL n = 78
44.9% Strongly Agree
47.4% Agree
6.4% Disagree
1.3% Strongly Disagree

MODIFIED VALIDITY: n = 78
51.3% Strongly Agree
41.0% Agree
6.4% Disagree
1.3% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY:

ORIGINAL n = 78
38.5% Strongly Agree
39.7% Agree
17.9% Disagree
3.8% Strongly Disagree

MODIFIED n = 78
46.2% Strongly Agree
42.3% Agree

7.7% Disagree
3.8% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY:

ORIGINAL n = 76
23.7% Strongly Agree
65.8% Agree
10.5% Disagree
0.0% Strongly Disagree

MODIFIED n = 78
51.3% Strongly Agree
42.3% Agree
6.4% Disagree
0.0% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

1. Initiation is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

2. Initiation is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

3. The description of Initiation is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

Diagnostic Classification of Bipedal Locomotion Third Round

4. Initiation is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

5. Initiation is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

6. The description of Initiation is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Termination
ORIGINAL CLASSIFICATION DESCRIPTION: Planned transition from walking to quiet standing

MODIFIED CLASSIFICATION NAME: Termination (no change)
MODIFIED CLASSIFICATION DESCRIPTION: Transition from walking to quiet standing

OPEN-ENDED RESPONSES: n = 16

PREFERENCE:
- Agree with/prefer Modified 6
- Prefer Original: Important to differentiate between planned stopping and unplanned (falling) 2

CLARIFY:
- Modified version too wordy
- Termination is standing balance – confuses events

SPECIFIC RECOMMENDATION:
- Name: "Gait Termination"
- Name: "Termination Impairment"
- Description: "Transition from walking to quiet posture/position"

GENERAL COMMENT:
- Classification does not include wheelchair locomotion
- Dropping planned includes other means of stopping eg. freezing

DIFFICULTY WITH SURVEY:
- error in survey questions

LIKERT SCALE RESPONSES - VALIDITY:

ORIGINAL n = 77
41.6% Strongly Agree
50.6% Agree
6.5% Disagree
1.3% Strongly Disagree

MODIFIED n = 76
53.9% Strongly Agree
39.5% Agree
5.3% Disagree
1.3% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY:

ORIGINAL n = 77
35.1% Strongly Agree
45.5% Agree
16.9% Disagree
2.6% Strongly Disagree

MODIFIED n = 76
48.7% Strongly Agree
36.8% Agree
11.8% Disagree
2.6% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY:

ORIGINAL n = 77

Diagnostic Classification of Bipedal Locomotion Third Round

22.1% Strongly Agree
68.8% Agree
9.1% Disagree
0.0% Strongly Disagree

MODIFIED n = 77
51.9% Strongly Agree
41.6% Agree
6.5% Disagree
0.0% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

7. Termination is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

8. Termination is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

9. The description of Termination is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

10. Termination is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

11. Termination is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

12. The description of Termination is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Rhythmical Limb Movement
ORIGINAL CLASSIFICATION DESCRIPTION: Manifestation of core locomotor pattern

MODIFIED CLASSIFICATION NAME: Coordination of Rhythmical Stepping and Arm Swing
MODIFIED CLASSIFICATION DESCRIPTION:Reciprocal and symmetrical upper and lower extremity motion during walking

OPEN-ENDED RESPONSES: n = 22

PREFERENCE:
• Agree with/prefer Modified 5
(1 of 5) refers to phases of gait and reciprocal nature
• Prefer Original - seems like a component of the original but not whole thing
CONSTRUCT:
• recognize the role of arm swing; it is not fundamental as required to be a diagnostic classification"
OVERLAP:
• Antigravity support
• Propulsion
• Foot clearance
CLARIFY:
• Still difficult to understand
• Not clear if stepping is during standing or walking
• Not clear how global or focused this is – symmetry only or include other kinematic factors?
TERMINOLOGY:
• Classification does not match definition. Rhythmic not necessarily symmetrical or reciprocal.
• Combines rhythmicity and reciprocal movement with symmetry; symmetry should be measured separately Arm and leg movement can be reciprocal and rhythmic but not symmetrical
• Definitions of coordination and symmetry not the same so confusing; May be reciprocal and coordinated but not symmetrical
SPECIFIC RECOMMENDATION:
• Name: "rhythmical" not necessary 2
• Name: "Coordinated Rhythmical Stepping and Arm Swing"
• Name: "Reciprocal and Symmetrical"
• Description: drop "symmetrical"
• Description: "Coordination of upper and lower extremity motion during walking"
CLINICAL UTILITY:
• Lack discrimination of pathological conditions
• Compensations of clinical population too varied for this to be useful classification
• Patient can have rhythmical stepping and non rhythmical arm swing

LIKERT SCALE RESPONSES - VALIDITY:

ORIGINAL: n = 76
21.1% Strongly Agree
46.1% Agree
31.6% Disagree
1.3% Strongly Disagree

MODIFIED: n = 76
32.9% Strongly Agree
50.0% Agree
17.1% Disagree
0.0% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY:

ORIGINAL n = 77

11.7% Strongly Agree
46.8% Agree
39.0% Disagree
2.6% Strongly Disagree

MODIFIED n = 77
26.0% Strongly Agree
46.8% Agree
24.7% Disagree
2.6% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY:

ORIGINAL n = 76
0.0% Strongly Agree
38.2% Agree
50.0% Disagree
11.8% Strongly Disagree

MODIFIED n = 77
26.0% Strongly Agree
53.2% Agree
18.2% Disagree
2.6% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

13. Rhythmical Limb Movement is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

14. Rhythmical Limb Movement is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

15. The description of Rhythmical Limb Movement is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

16. Coordination of Rhythmical Stepping and Arm Swing is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

17. Coordination of Rhythmical Stepping and Arm Swing is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

18. The description of Coordination of Rhythmical Stepping and Arm Swing is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Anti-Gravity Support
ORIGINAL CLASSIFICATION DESCRIPTION: Generation of torques in stance limb and trunk sufficient to withstand gravity

MODIFIED CLASSIFICATION NAME: Stance Stability
MODIFIED CLASSIFICATION DESCRIPTION: Generation of torques in trunk and limbs sufficient for stance stability

OPEN-ENDED RESPONSES: n = 27

PREFERENCE:
- Agree with/prefer Modified 2
- Prefer Original 2
- Prefer Original name and Modified description

CONSTRUCT:
- Original implied torques to counteract gravity; modified implies torques to resist forces all directions - both important but different
- Torque withstand gravity not same as stability during stance stability suggests a balance component
- Stability rather than anti-gravity implies balance

CLARITY:
- Not clear if this is meant to be during single or double limb stance or whole gait cycle 3
- Could be confused with quiet standing 3
- Could be confusing if stable but not good "form"
- Not clear if arm support is included
- Torques is not readily understandable

TERMINOLOGY:
- Stability - ambiguous 2
- Moments not Torque 3

CLINICAL UTILITY:
- easier for clinicians to understand stance stability as compared with anti-gravity support
- "Requires use of UEs to stabilize LEs and trunk" could be used as a rating for this classification

SPECIFIC RECOMMENDATION:
- Description: "Sufficient for "upright" stability"
- Description: "Sufficient to maintain and upright posture during stance"
- Needs to include passive structures
- If this classification is to be used observationally, then use of torque or joint kinetics should not be used

GENERAL COMMENT:
- does not include use of upper extremities or other compensations
- does not differentiate between active and passive support
- modified name and original description imply static versus dynamic movement

LIKERT SCALE RESPONSES - VALIDITY:

ORIGINAL n = 78
20.5% Strongly Agree
51.3% Agree
26.9% Disagree
1.3% Strongly Disagree

MODIFIED n= 78
41.0% Strongly Agree
48.7% Agree
7.7% Disagree
2.6% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY:

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL n = 78
14.1% Strongly Agree
52.6% Agree
30.8% Disagree
2.6% Strongly Disagree

MODIFIED n= 78
29.5% Strongly Agree
47.4% Agree
21.8% Disagree
1.3% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY:

ORIGINAL n = 78
6.4% Strongly Agree
55.1% Agree
33.3% Disagree
5.1% Strongly Disagree

MODIFIED n= 78
26.9% Strongly Agree
50.0% Agree
19.2% Disagree
3.8% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

19. Anti-Gravity Support is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

20. Anti-Gravity Support is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

21. The description of Anti-Gravity Support is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

22. Stance Stability is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

23. Stance Stability is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

24. The description of Stance Stability is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Page 15

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Active Propulsion
ORIGINAL CLASSIFICATION DESCRIPTION: Generation of torques primarily in the ankle to accelerate body center of mass in forward direction

MODIFIED CLASSIFICATION NAME: Progression During Stance
MODIFIED CLASSIFICATION DESCRIPTION: Generation of torques to accelerate body center of mass in direction of locomotion

OPEN ENDED RESPONSES: n = 30

PREFERENCE:
- Agree with/prefer Modified 3
- Prefer Original 3
- No preference
- do not like either
- Prefer Original name and Modified description
- Remove - this cannot be observed; stance stability is what is important

CONSTRUCT:
- prefer active propulsion or pushoff (work done by stance leg) to progression during stance (forward movement of body)
- what part of the locomotor cycle are you trying to define? Stance implies stance phase vs active propulsion implies terminal stance and pre-swing

OVERLAP:
- Occurs during stance stability – not exclusive
- sounds like stance

CLARIFY:
- Termination is standing balance – confuses events
- Stance signifies static posture
- Torques difficult concept

TERMINOLOGY:
- Is torques the right word?
- Muscles generate moments, not torques

CLINICAL UTILITY:
- May be tricky for therapists to differentiate stance stability and progression during stance
- Active propulsion could be one graded category of progression – ideal
- Internal vs external component to the assessment
- progression of stance not clear

SPECIFIC RECOMMENDATION:
- Name: delete 'During stance"
- Name: "Active Propulsion During Stance Phase"
- Description: "accelerate body center of mass forward" (vs direction of locomotion)
- Description: keep ankle torques
- Description should include ability to generate momentum from swing leg
- Description: "power" vs "progression"
- Description: "control" versus "accelerate"
- Make sure description states that propulsion occurs in second half of stance phase
- If this is to be used observationally, then use of torque or joint kinetics should not be used

GENERAL COMMENT:
- Progression during stance occurs in the trunk
- Classification seems much more general
- There is no foot progression during stance
- Last 2 classifications related to vertical vs horizontal torques
- Stance limb not always accelerating in forward direction – in early stance leading limb is decelerating the COM

LIKERT SCALE RESPONSES - VALIDITY:

ORIGINAL n = 78
20.5% Strongly Agree
51.3% Agree

24.4% Disagree
3.8% Strongly Disagree

MODIFIED n= 78
30.8% Strongly Agree
50.0% Agree
15.4% Disagree
3.8% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY:

ORIGINAL n = 78
17.9% Strongly Agree
47.4% Agree
30.8% Disagree
3.8% Strongly Disagree

MODIFIED n= 77
24.7% Strongly Agree
46.8% Agree
26.0% Disagree
2.6% Strongly Disagree

LIKERT SCALE RESPONSES TO - UNDERSTANDABILITY:

ORIGINAL n = 77
11.7% Strongly Agree
49.4% Agree
32.5% Disagree
6.5% Strongly Disagree

MODIFIED n= 78
24.4% Strongly Agree
44.9% Agree
24.4% Disagree
6.4% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

25. Active Propulsion is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

26. Active Propulsion is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

27. The description of Active Propulsion is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

28. Progression During Stance is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

29. Progression During Stance is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

30. The description of Progression During Stance is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Page 18

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Foot Clearance
MODIFIED CLASSIFICATION DESCRIPTION: Trajectory of the swinging foot such that it clears the support surface

MODIFIED CLASSIFICATION NAME: Swing Limb Advancement
MODIFIED CLASSIFICATION DESCRIPTION: Ability to lift the swing limb clear of the support surface to progress it in the direction of locomotion

OPEN ENDED RESPONSES: n = 27

PREFERENCE:
- Agree with/prefer Modified 8
- Prefer Original 1

CONSTRUCT:
- Swing limb advancement involves proximal mechanics; foot clearance is separate (influenced by proximal and distal mechanics)
- Swing limb advancement does not reflect the need to lift the foot off the floor
- Foot clearance more important that swing limb advancement; don't want to lose foot clearance
- Two different things; clearance is clearance; advancement is step length
- Not sure what component of gait you are trying to describe; went from specific to complex; this is not the same as Rancho swing limb advancement

CLARIFY:
- Not clear if "it" refers to the limb or the surface

OVERLAP:
- rhythmical 2
- Dependent on the contralateral stance

CLINICAL UTILITY:
- Broader than the original and could make clinical assessment more difficult
- Where do proximal compensatory patterns fit in? 3
- The trajectory is a way of grading how the swing limb advances

SPECIFIC RECOMMENDATION:
- Description: "Ability to lift the swing limb clear of the support surface to progress it forward"
- Description: Remove "ability to" Lifting of the swing limb
- Description: Remove clear in "ability to lift the swing limb from the support surface"
- Description: Clear "a potential obstruction," not "the support surface"

GENERAL COMMENT:
- The original is more specific and less global than the modified
- Swing limb does not progress only in direction of progression (rotations, abduction/adduction)

LIKERT SCALE RESPONSES - VALIDITY

ORIGINAL n = 78
28.2% Strongly Agree
55.1% Agree
15.4% Disagree
1.3% Strongly Disagree

MODIFIED n = 78
43.6% Strongly Agree
43.6% Agree
12.8% Disagree
0.0% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY

ORIGINAL n = 78
21.8% Strongly Agree
59.0% Agree

19.2% Disagree
0.0% Strongly Disagree

MODIFIED n = 78
33.3% Strongly Agree
39.7% Agree
25.6% Disagree
1.3% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY

ORIGINAL n = 77
15.6% Strongly Agree
64.9% Agree
19.5% Disagree
0.0% Strongly Disagree

MODIFIED n = 77
33.8% Strongly Agree
44.2% Agree
18.2% Disagree
3.9% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

31. Foot Clearance is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

32. Foot Clearance is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

33. The description of Foot Clearance is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

Diagnostic Classification of Bipedal Locomotion Third Round

34. Swing Limb Advancement is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

35. Swing Limb Advancement is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

36. The description of Swing Limb Advancement is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Proactive Dynamic Equilibrium
ORIGINAL CLASSIFICATION DESCRIPTION: Production of balance responses that are implemented for the expected perturbations accompanying walking and any other concurrent movements made during walking

MODIFIED CLASSIFICATION NAME: Anticipatory Dynamic Balance
MODIFIED CLASSIFICATION DESCRIPTION: Postural adjustments in preparation for expected perturbations accompanying walking in order to achieve dynamic equilibrium

OPEN-ENDED RESPONSES: n = 16

PREFERENCE:
- Agree with/prefer Modified 4
- No preference
- Prefer Original name and Modified description

CLARITY:
- "in order to achieve dynamic equilibrium" is vague
- "in preparation for unexpected" – awkward
- lot of jargon in the name/description; dynamic and anticipatory is awkward combination
- Use a parenthetical description to clarify

OVERLAP:
- Stance stability - includes dynamic balance

CLINICAL UTILITY:
- dynamic balance in the context of gait difficult to isolate and evaluate
- not sure how distinguishable anticipatory and reactive will be
- too vague to determine clinically
- will be hard to identify equlibrium unless patient falls - what would the threshold be?

SPECIFIC RECOMMENDATION:
- Name: "Dynamic" unnecessary; entire task dynamic
- Name: "Anticipatory locomotor balance"
- Description: In order to "maintain COM over BOS"
- Description: Delete "postural"
- Description: "maintain balance" vs "maintain dynamic equilibrium"
- Dynamic more appropriate in description than title

GENERAL COMMENT:
- Isn't all balance dynamic?

LIKERT SCALE RESPONSES - VALIDITY

ORIGINAL n = 77
11.7% Strongly Agree
49.4% Agree
33.8% Disagree
5.2% Strongly Disagree

MODIFIED n = 77
33.8% Strongly Agree
57.1% Agree
7.8% Disagree
1.3% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY

ORIGINAL n = 77
9.1% Strongly Agree
41.6% Agree

45.5% Disagree
3.9% Strongly Disagree

MODIFIED n = 77
27.3% Strongly Agree
53.2% Agree
18.2% Disagree
1.3% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY

ORIGINAL n = 77
6.5% Strongly Agree
44.2% Agree
37.7% Disagree
11.7% Strongly Disagree

MODIFIED n = 77

32.5% Strongly Agree
54.5% Agree
13.0% Disagree
0.0% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

37. Proactive Dynamic Equilibrium is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

38. Proactive Dynamic Equilibrium is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

39. The description of Proactive Dynamic Equilibrium is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

40. Anticipatory Dynamic Balance is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

41. Anticipatory Dynamic Balance is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

42. The description of Anticipatory Dynamic Balance is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Page 24

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Reactive Dynamic Equilibrium
ORIGINAL CLASSIFICATION DESCRIPTION Detection of unexpected perturbations from stimulated sensory systems and subsequent correction/stabilization

MODIFIED CLASSIFICATION NAME: Reactive Dynamic Balance
MODIFIED CLASSIFICATION DESCRIPTION: Detection of and response to unexpected perturbations that occur during walking in order to achieve dynamic equilibrium

OPEN-ENDED RESPONSES: n = 16

PREFERENCE:
- Agree with/prefer Modified 4
- Prefer Original
- No Preference

CLINICAL UTILITY:
- not sure how to determine if it was detected or not – we can only assess if there was a response or not
- detecting the perturbation and responding are two very different abilities. How to rate if different?
- Not sure how distinguishable anticipatory and reactive will be
- If impaired how to tease out motor versus sensory?
- will be hard to identify equlibrium unless patient falls - what would the threshold be?

SPECIFIC RECOMMENDATION:
- Name: "Dynamic" unecessary - entire task is dynamic
- Name: "Reactive Locomotor Balance" (put dynamic in description with examples)
- Description: "maintain balance" vs "maintain dynamic equilibrium"
- Description: "maintain COM over BOS"
- Description: "respond or maintain pre-perturbation locomotor pattern"
- Description "In order to maintain dynamic equilibrium

GENERAL COMMENT:
- Isn't all balance dynamic?
- Refers to balance impairments
- Less specific
- Balance can be static or dynamic. Equilibrium refers to dynamic situations

LIKERT SCALE RESPONSES - VALIDITY

ORIGINAL n = 77
9.1% Strongly Agree
67.5% Agree
22.1% Disagree
1.3% Strongly Disagree

MODIFIED n = 76
30.3% Strongly Agree
61.8% Agree
6.6% Disagree
1.3% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY

ORIGINAL n = 77
10.4% Strongly Agree
53.2% Agree
35.1% Disagree
1.3% Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

MODIFIED n = 77
28.6% Strongly Agree
54.5% Agree
15.6% Disagree
1.3% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY

ORIGINAL n = 77
3.9% Strongly Agree
54.5% Agree
35.1% Disagree
6.5% Strongly Disagree

MODIFIED n = 77
27.3% Strongly Agree
58.4% Agree
11.7% Disagree
2.6% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

43. Reactive Dynamic Equilibrium is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

44. Reactive Dynamic Equilibrium is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

45. The description of Reactive Dynamic Equilibrium is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

Diagnostic Classification of Bipedal Locomotion Third Round

46. Reactive Dynamic Balance is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

47. Reactive Dynamic Balance is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

48. The description of Reactive Dynamic Balance is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Steering and Accommodation
ORIGINAL CLASSIFICATION DESCRIPTION: Adaptation of gait to accommodate or avoid environmental or other contextual demands

MODIFIED CLASSIFICATION NAME: Adaptability
MODIFIED CLASSIFICATION DESCRIPTION: Ability to adjust gait to accommodate changes in physical environment (eg. unlevel terrain, obstacles, slippery conditions) or other contextual demands (eg. crowds, being in a hurry) that require a change in direction, path or speed

OPEN-ENDED RESPONSES: n = 16

PREFERENCE:
- Agree with/prefer Modified 2
- No preference
- Prefer simplicity of Original for teaching and training. Prefer description of Modified for explaining to third party payers why a person needs gait training

CLINICAL UTILITY: Difficult to distinguish clinically from anticipatory and reactive
OVERLAP:
- anticipatory dynamic balance 3
- reactive dynamic balance
- Anticipatory and reactive dynamic 3
- only physical part (contextual part is mutually exclusive)
- multi tasking – could be considered a type of contextual demand

SPECIFIC RECOMMENDATION:
- Name: "Accommodation and Adaptability"
- leave this classification to physical demands and multi-tasking to cognitive demands

GENERAL COMMENT:
- too broad needs to be narrowed
- think this is an attribute of gait, but wandering and difficulty with environment is complex
- The new adaptability classifier captures my point about Variability in round 1

LIKERT SCALE RESPONSES - VALIDITY

ORIGINAL n = 77
14.3% Strongly Agree
54.5% Agree
29.9% Disagree
1.3% Strongly Disagree

MODIFIED n = 77
40.3% Strongly Agree
48.1% Agree
11.7% Disagree
0.0% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY

ORIGINAL n = 77
10.4% Strongly Agree
36.4% Agree
48.1% Disagree
5.2% Strongly Disagree

MODIFIED n = 76
26.3% Strongly Agree
42.1% Agree
27.6% Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

3.9% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY

ORIGINAL n = 77
7.8% Strongly Agree
46.8% Agree
40.3% Disagree
5.2% Strongly Disagree

MODIFIED n = 77
42.9% Strongly Agree
44.2% Agree
13.0% Disagree
0.0% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

49. Steering and Accommodation is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

50. Steering and Accomodation is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

51. The description of Steering and Accommodation is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

Diagnostic Classification of Bipedal Locomotion Third Round

52. Adaptability is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

53. Adaptability is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

54. The description of Adaptability is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Spatial Mapping
ORIGINAL CLASSIFICATION DESCRIPTION: Perceptual representation of large scale areas

MODIFIED CLASSIFICATION NAME: Navigation to Unseen Locations
MODIFIED CLASSIFICATION DESCRIPTION: Visual perceptual representation of large scale areas to allow pathfinding to known, but unseen locations

OPEN-ENDED RESPONSES: n = 27

PREFERENCE:
- Agree with/prefer Modified 2
- No preference

CLARITY:
- Difficult to interpret and understand; especially "unseen locations" 7
- Clumsy wording
- Whose perception, the patient or the examiner?
- "Large" is vague

OVERLAP:
- adaptability 2

CONSTRUCT:
- Why only unseen locations?
- Is navigation to unseen locations the main criterion? Seems that navigation to observed destinations along a path is better
- Does the location have to be out of view? 2
- Excludes pathfinding to new locations
- Don't agree with unseen locations only - seen with obstacles important too
- What about navigation to seen locations?
- not clear of the goal of this classification
- This category seems more cognitive than I believe is intended. You are wanting them to move to an intended destination. Its their ability to get from point A to point B in an efficient and safe manner that's a concern

SPECIFIC RECOMMENDATION:
- Name: "Visual Perceptual Navigation"
- Name: "Spatial Mapping and Navigation" being able to produce the spatial map and navigate using it
- Description: "Seen, but first time traveling there"
- Description: delete "visual perceptual"
- Would not use unseen locations in both name and description

CLINICAL UTILITY
- Unclear how this will be assessed

LIKERT SCALE RESPONSES - VALIDITY

ORIGINAL n = 76
6.6% Strongly Agree
55.3% Agree
38.2% Disagree
0.0% Strongly Disagree

MODIFIED n = 76
11.8% Strongly Agree
50.0% Agree
35.5% Disagree
2.6% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY

ORIGINAL n = 76

Diagnostic Classification of Bipedal Locomotion Third Round

9.2% Strongly Agree
44.7% Agree
40.8% Disagree
5.3% Strongly Disagree

MODIFIED n = 75
17.3% Strongly Agree
46.7% Agree
32.0% Disagree
4.0% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY

ORIGINAL n = 76
2.6% Strongly Agree
35.5% Agree
53.9% Disagree
7.9% Strongly Disagree

MODIFIED n = 76

13.2% Strongly Agree
47.4% Agree
34.2% Disagree
5.3% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

55. Spatial Mapping is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

56. Spatial Mapping is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

57. The description of Spatial Mapping is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

58. Navigation to Unseen Locations is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

59. Navigation to Unseen Locations is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

60. The description of Navigation to Unseen Locations is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Page 33

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Dual Task Capacity
ORIGINAL CLASSIFICATION DESCRIPTION: Appropriate allocation of attention among simultaneous tasks

MODIFIED CLASSIFICATION NAME: Multi Task Capacity
MODIIFIED CLASSIFICATION DESCRIPTION: Appropriate allocation of attention among psychomotor and/or cognitive tasks that are carried out while walking

OPEN-ENDED RESPONSES: n = 18
PREFERENCE:
• Agree with/prefer Modified 8
• Prefer Original name and Modified definition
CLARITY:
• Term capacity unclear – capacity could imply individual has the resources or ability...but actual performance does not reflect capacity
• Is it capacity or capability?
OVERLAP:
• with adaptability 3
SPECIFIC RECOMMENDATION:
• Need to differentiate between cognitive and motor tasks
• Include capacity and allocation in name and description – they are different
• Description: "between" instead of "among"
CLINICAL UTILITY:
• attention (allocation of) difficult to measure 3
GENERAL COMMENT:
• what we are interested in is outcome of multi-tasking
• description only relates to attention paid, not other motor planning or coordination systems
• cognitive domain – what is important is walking can be automatic – allows one to attend to other things. Post-injury walking is more cognitively demanding. Some automaticity may return with training.

LIKERT SCALE RESPONSES - VALIDITY

ORIGINAL n = 76
17.1% Strongly Agree
67.1% Agree
15.8% Disagree
0.0% Strongly Disagree

MODIFIED n = 77
48.1% Strongly Agree
45.5% Agree
6.5% Disagree
0.0% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY

ORIGINAL n = 77
14.3% Strongly Agree
58.4% Agree
27.3% Disagree
0.0% Strongly Disagree

MODIFIED n = 76
42.1% Strongly Agree
43.4% Agree
14.5% Disagree
0.0% Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

LIKERT SCALE RESPONSES - UNDERSTANDABILITY

ORIGINAL n = 77
6.5% Strongly Agree
67.5% Agree
24.7% Disagree
1.3% Strongly Disagree

MODIFIED n = 77
45.5% Strongly Agree
46.8% Agree
7.8% Disagree
0.0% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

61. Dual Task Capacity is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

62. Dual Task Capacity is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

63. The description of Dual Task Capacity is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

Diagnostic Classification of Bipedal Locomotion Third Round

64. Multi Task Capacity is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

65. Multi Task Capacity is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

66. The description of Multi Task Capacity is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Page 36

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Balance Confidence
ORIGINAL CLASSIFICATION DESCRIPTION: Self-perceived walking capability

MODIFIED CLASSIFICATION NAME: Walking Confidence
MODIFIED CLASSIFICATION DESCRIPTION: Self-perceived walking capability (no change)

OPEN-ENDED RESPONSES: n = 17
PREFERENCE:
• Agree with/prefer Modified 6
• No preference
• Remove this is something that has to be gathered from the patient. while important, doesn't fit with the clinician evaluated, objective nature of all of the other categories 2
SPECIFIC RECOMMENDATION:
• "Walking safety and confidence"
• needs more description eg. balance, distance how walking looks to others
CLINICAL UTILITY:
• how measured - self rating by patient? 3
• not sure how objective this can be
GENERAL COMMENT:
• modified version is very specific
• balance and walking confidence are 2 different things
• both are not parallel
• as a gait classification not sure I am on the same page but an attribute of successful walking

LIKERT SCALE RESPONSES - VALIDITY

ORIGINAL n = 77
10.4% Strongly Agree
50.6% Agree
37.7% Disagree
1.3% Strongly Disagree

MODIFIED n = 77
36.4% Strongly Agree
51.9% Agree
10.4% Disagree
1.3% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY

ORIGINAL n = 76
10.5% Strongly Agree
50.0% Agree
38.2% Disagree
1.3% Strongly Disagree

MODIFIED n = 75
34.7% Strongly Agree
48.0% Agree
16.0% Disagree
1.3% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL n = 76
11.8% Strongly Agree
56.6% Agree
31.6% Disagree
0.0% Strongly Disagree

MODIFIED n = 77
37.7% Strongly Agree
54.5% Agree
7.8% Disagree
0.0% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

67. Balance Confidence is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

68. Balance Confidence is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

69. The description of Balance Confidence is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

70. Walking Confidence is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

71. Walking Confidence is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

72. The description of Walking Confidence is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Page 39

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Purposefulness
ORIGINAL CLASSIFICATION DESCRIPTION: Set goal; initiate and achieve goal as planned

MODIFIED CLASSIFICATION NAME: Purposefulness (no change)
MODIFIED CLASSIFICATION DESCRIPTION: Ability to utilize locomotion as part of a plan to achieve a set goal

OPEN-ENDED RESPONSES: n = 17

PREFERENCE:
- Agree with/prefer Modified 3
- Prefer Original 2
- Remove 3

CLARITY:
- Vague/not clear 2
- These are not different again?
- Goal of locomotion not defined – accuracy, speed, energy efficiency, what?
- too broad – any limitation in locomotion would fall under the modified description

OVERLAP:
- Navigation to Unseen Locations 3

SPECIFIC RECOMMENDATION:
- Name: "Walking safety and confidence"
- needs more description balance, distance how waking looks to others
- Description: "ability to set, initiate, achieve planned goal via locomotion"

CLINICAL UTILITY: assessment 3

GENERAL COMMENT:
- The comments that question whether purposefulness is related to cognition or motivation or ability to problem solve is important and is not addressed
- locomotion does not need to be purposeful to be intact and unimpaired. Cognitive loss is not a locomotor dysfunction
- maybe this classification is more about motivation than ability

LIKERT SCALE RESPONSES - VALIDITY

ORIGINAL n = 77
15.6% Strongly Agree
54.5% Agree
23.4% Disagree
6.5% Strongly Disagree

MODIFIED n = 76
18.4% Strongly Agree
52.6% Agree
22.4% Disagree
6.6% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY

ORIGINAL n = 77
13.0% Strongly Agree
53.2% Agree
29.9% Disagree
3.9% Strongly Disagree

MODIFIED n = 77
16.9% Strongly Agree
54.5% Agree

26.0% Disagree
2.6% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY

ORIGINAL n = 76
9.2% Strongly Agree
50.0% Agree
36.8% Disagree
3.9% Strongly Disagree

MODIFIED n = 77
20.8% Strongly Agree
55.8% Agree
18.2% Disagree
5.2% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

73. Purposefulness is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

74. Purposefulness is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

75. The description of Purposefulness is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

Diagnostic Classification of Bipedal Locomotion Third Round

76. Purposefulness is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

77. Purposefulness is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

78. The description of Purposefulness is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Energy Cost
ORIGINAL CLASSIFICATION DESCRIPTION: Cardiovascular and respiratory demands associated with locomotion

MODIFIED CLASSIFICATION NAME: Metabolic Energy Expenditure
MODIFIED CLASSIFICATION DESCRIPTION: Energy demand and resources sufficiently matched to achieve locomotor goals

OPEN-ENDED RESPONSES: n = 24
PREFERENCE:
- Agree with/prefer Modified 3
- Prefer Original
- No preference
- Prefer modified name and original description (modified description – "resources" implies muscular endurance or strength)
- Prefer Original name with Modified description

CLARITY:
- Still vague – energy demands can be mechanical or metabolic – description should be specific as to the source of energy demand
- Who is setting the goals – patient or clinician?
- not sure what "metabolic" adds
- Not clear what "resources" means in terms of matching to energy demand
- More difficult to understand
- What is meant by metabolic energy expenditure -just caloric expenditure? – cardiovascular and respiratory have a place here too
- Needs additional refinement
- Why matched?
- Different connotation with use of metabolic is this just metabolic (cellular), not perceptual?

SPECIFIC RECOMMENDATION:
- Energy Expenditure: Cardiovascular, respiratory, and muscular endurance demands associated with locomotion"
- Name: Change to "metabolic cost"
- Name: "Energy demands/expenditure"
- Name: Remove Metabolic 2
- Name: "Expenditure" better than "cost" (depends on walking speed and metabolic demand)
- Name: "Aerobic endurance"
- Name: "Energy Cost – but needs to be redefined to include emotional energy or stress or fear of falling"
- Description: "Energy resources matched with locomotor demands"
- Description: "Sufficiency of energy resources to meet demands of locomotion"
- Description: "Metabolic energy demands of sustained walking"
- Need to differentiate energy per time vs energy per distance

CLINICAL UTILITY:
- too specific for observational scale
- sufficiently matched – how will that be scored?
- Need for equipment not commonly used /available clinically 2

LIKERT SCALE RESPONSES - VALIDITY

ORIGINAL n = 75

26.7% Strongly Agree
60.0% Agree
13.3% Disagree
0.0% Strongly Disagree

MODIFIED n = 76
35.5% Strongly Agree
51.3% Agree
13.2% Disagree
0.0% Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY

ORIGINAL n = 76
30.3% Strongly Agree
48.7% Agree
21.1% Disagree
0.0% Strongly Disagree

MODIFIED n = 76
35.5% Strongly Agree
46.1% Agree
18.4% Disagree
0.0% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY

ORIGINAL n = 77
19.5% Strongly Agree
50.6% Agree
27.3% Disagree
2.6% Strongly Disagree

MODIFIED n = 76
28.9% Strongly Agree
42.1% Agree
26.3% Disagree
2.6% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

79. Energy Cost is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

80. Energy Cost is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

81. The description of Energy Cost is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

82. Energy Expenditure is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

83. Energy Expenditure is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

84. The description of Energy Expenditure is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Page 45

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL CLASSIFICATION NAME: Long-Term Viability
ORIGINAL CLASSIFICATION DESCRIPTION: Stress on musculoskeletal system during locomotion

MODIFIED CLASSIFICATION NAME: Long-Term Musculoskeletal Integrity
MODIFIED CLASSIFICATION DESCRIPTION: Ability of musculoskeletal system to withstand the demands of locomotion over the lifespan

OPEN-ENDED RESPONSES: n = 14
PREFERENCE:
- Agree with/prefer Modified 3
- Remove - no evidence to support this; too subjective does not add value to classification schema

CLARITY:
- Seems vague
- Not at all clear – are we trying to identify current factors that will negatively impact the long term integrity of the musculoskeletal system?
- Lacks specificity – talking about muscles, tendons, ligaments or bone?

SPECIFIC RECOMMENDATION:
- "Risk for" should be in desription
- "Biomechanical efficiency: Stresses of locomotion absorbed or counteracted by musculoskeletal system such that tissue injury does not occur"

CLINICAL UTILITY:
- clinical assessment 2
- very subjective

GENERAL COMMENT:
- A causation is implied here that is not clearly proven for many of the altered patterns
- not sure this is necessary why specific to musculoskeletal system?

LIKERT SCALE RESPONSES - VALIDITY

ORIGINAL n = 78
7.7% Strongly Agree
41.0% Agree
46.2% Disagree
5.1% Strongly Disagree

MODIFIED n = 78
30.8% Strongly Agree
43.6% Agree
20.5% Disagree
5.1% Strongly Disagree

LIKERT SCALE RESPONSES - MUTUAL EXCLUSIVITY

ORIGINAL n = 76
11.8% Strongly Agree
46.1% Agree
36.8% Disagree
5.3% Strongly Disagree

MODIFIED n = 78
32.1% Strongly Agree
46.2% Agree
16.7% Disagree
5.1% Strongly Disagree

LIKERT SCALE RESPONSES - UNDERSTANDABILITY

Diagnostic Classification of Bipedal Locomotion Third Round

ORIGINAL n = 78
3.8% Strongly Agree
28.2% Agree
56.4% Disagree
11.5% Strongly Disagree

MODIFIED n = 78
30.8% Strongly Agree
44.9% Agree
20.5% Disagree
3.8% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the ORIGINAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

85. Long-Term Viability is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

86. Long-Term Viability is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

87. The description of Long-Term Viability is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the MODIFIED classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

88. Long-Term Musculoskeletal Integrity is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

89. Long-Term Musculoskeletal Integrity is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

90. The description of Long-Term Musculoskeletal Integrity is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the original or modified classification?

Six additional diagnostic classifications were proposed by the expert panel in Round 1. These were presented to and evaluated by the panel in Round 2. Respondents' overall comments about the additions are presented below. Please review these before you proceed to rate the validity, mutual exclusivity, and clarity of the additional classifications using a Likert scale. You will have an additional opportunity to provide open-ended comments.

PURPOSE:

• The usefulness of the 6 new classifications is difficult (impossible?) to assess without more information. I do not see how these fit into the purpose. The integration of information derived from these measures is complex and not easily captured in a single phrase.

• Many of the 6 new classifications proposed appear to be "ways of analyzing", or "approaches", versus "requirements" (as suggested). These may be helpful if you are looking to be more comprehensive in identifying different attributes of locomotion, but they do not help illustrate fundamental "requirements". "Standing stability" is a function related to locomotion, but entirely distinct.

CLINICAL UTILITY:

•The last six items require highly specialized measurements for many of the items. This will limit the applicability of these items. In addition, without seeing how these items are to be rated/scored, almost all individuals with any gait pathology will like present with alterations in kinematics/kinetics/TD measures.

OVERLAP:

• While all are important to gait description, I think Kinematics, Kinetics, and Body Structures/Function will show overlap with the Temporal and Spatial category, as well as the Swing Limb Advancement, Active Propulsion, etc.. Essentially, they would be the reasons behind the resulting Temporal and Spatial results.

• I think the velocity, sequencing portions related to joint kinematics can be added to the definitions of swing limb advancement, foot clearance, and other categories.

• I didn't like any of the newly proposed classifications. I think that kinetics, kinematics, temporal/spatial gait characteristics could all be lumped under rhythmical gait, with a slightly expanded definition. Or maybe have one additional category that incorporates all these things.

DIFFICULTY WITH SURVEY:

• Would have liked an opportunity to comment on the additions...felt limited by the likert scale

Diagnostic Classification of Bipedal Locomotion Third Round

CLASSIFICATION NAME: Joint and Segmental Kinematics Gait
CLASSIFICATION DESCRIPTION: Position, displacement, velocity and acceleration of the body segments during walking often organized by the phases of gait.

LIKERT SCALE RESPONSES:

VALIDITY n = 75
25.3% Strongly Agree
53.3% Agree
18.7% Disagree
2.7% Strongly Disagree

MUTUAL EXCLUSIVITY n = 76
14.5% Strongly Agree
35.5% Agree
44.7% Disagree
5.3% Strongly Disagree

UNDERSTANDABILITY n = 76
18.4% Strongly Agree
60.5% Agree
19.7% Disagree
1.3% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the proposed ADDITIONAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

91. Joint and Segmental Kinematics of Gait is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

92. Joint and Segmental Kinematics of Gait is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

93. The description of Joint and Segmental Kinematics of Gait is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the additional classification?

CLASSIFICATION NAME: Temporal and Spatial Descriptors of Gait
CLASSIFICATION DESCRIPTION: Temporal and spatial measures of gait cycle and/or observations about quality of gait pattern.

OPEN-ENDED RESPONSES:
• speed is possibly a consideration but not in the context of other spatiotemporal parameters - only b/c speed is known to be so related to function.

LIKERT SCALE RESPONSES:

VALIDITY n = 76
32.9% Strongly Agree
51.3% Agree
15.8% Disagree
0.0% Strongly Disagree

MUTUAL EXCLUSIVITY n = 76
23.7% Strongly Agree
42.1% Agree
31.6% Disagree
2.6% Strongly Disagree

UNDERSTANDABILITY n = 75

22.7% Strongly Agree
57.3% Agree
20.0% Disagree
0.0% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the proposed ADDITIONAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

94. Temporal and Spatial Descriptors of Gait is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

95. Temporal and Spatial Descriptors of Gait is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

96. The description of Temporal and Spatial Descriptors of Gait is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the additional classification?

CLASSIFICATION NAME: Standing Stability
CLASSIFICATION DESCRIPTION: Capacity to attain upright posture and maintain standing balance

OPEN-ENDED RESPONSES:
• Standing stability & stance stability seem to be the same thing. I like "stance stability impairment" better.
• Standing is mutually exclusive from the other categories, but standing is not walking. I feel strongly that this should NOT be included. There is already a category for Stance phase support/balance.

LIKERT SCALE RESPONSES:

VALIDITY n = 76
10.5% Strongly Agree
46.1% Agree
32.9% Disagree
10.5% Strongly Disagree

MUTUAL EXCLUSIVITY n = 75
12.0% Strongly Agree
33.3% Agree
49.3% Disagree
5.3% Strongly Disagree

UNDERSTANDABILITY n = 76
10.5% Strongly Agree
63.2% Agree
26.3% Disagree
0.0% Strongly Disagree

FOR THE NEXT 3 QUESTIONS, please rate the proposed ADDITIONAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

Diagnostic Classification of Bipedal Locomotion Third Round

97. Standing Stability is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

98. Standing Stability is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

99. The description of Standing Stability is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the additional classification?

CLASSIFICATION NAME: Kinetics of Gait
CLASSIFICATION DESCRIPTION: Forces applied across joints, moments generated by muscles and mechanical power and energy generated during walking.

LIKERT SCALE RESPONSES: n = 76

23.7% Strongly Agree
48.7% Agree
25.0% Disagree
2.6% Strongly Disagree

MUTUAL EXCLUSIVITY n = 77
14.3% Strongly Agree
29.9% Agree
49.4% Disagree
6.5% Strongly Disagree

UNDERSTANDABILITY n = 77
18.2% Strongly Agree
57.1% Agree
23.4% Disagree
1.3% Strongly Disagree

Diagnostic Classification of Bipedal Locomotion Third Round

FOR THE NEXT 3 QUESTIONS, please rate the proposed ADDITIONAL classification name and description. Respond to each question by clicking whether you strongly agree, agree, disagree, or strongly disagree with the statement.

100. Kinetics of Gait is a valid diagnostic classification for locomotion.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

101. Kinetics of Gait is mutually exclusive of the other classifications.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

102. The description of Kinetics of Gait is understandable.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

Comments about the additional classification?

Page 53